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January 1961

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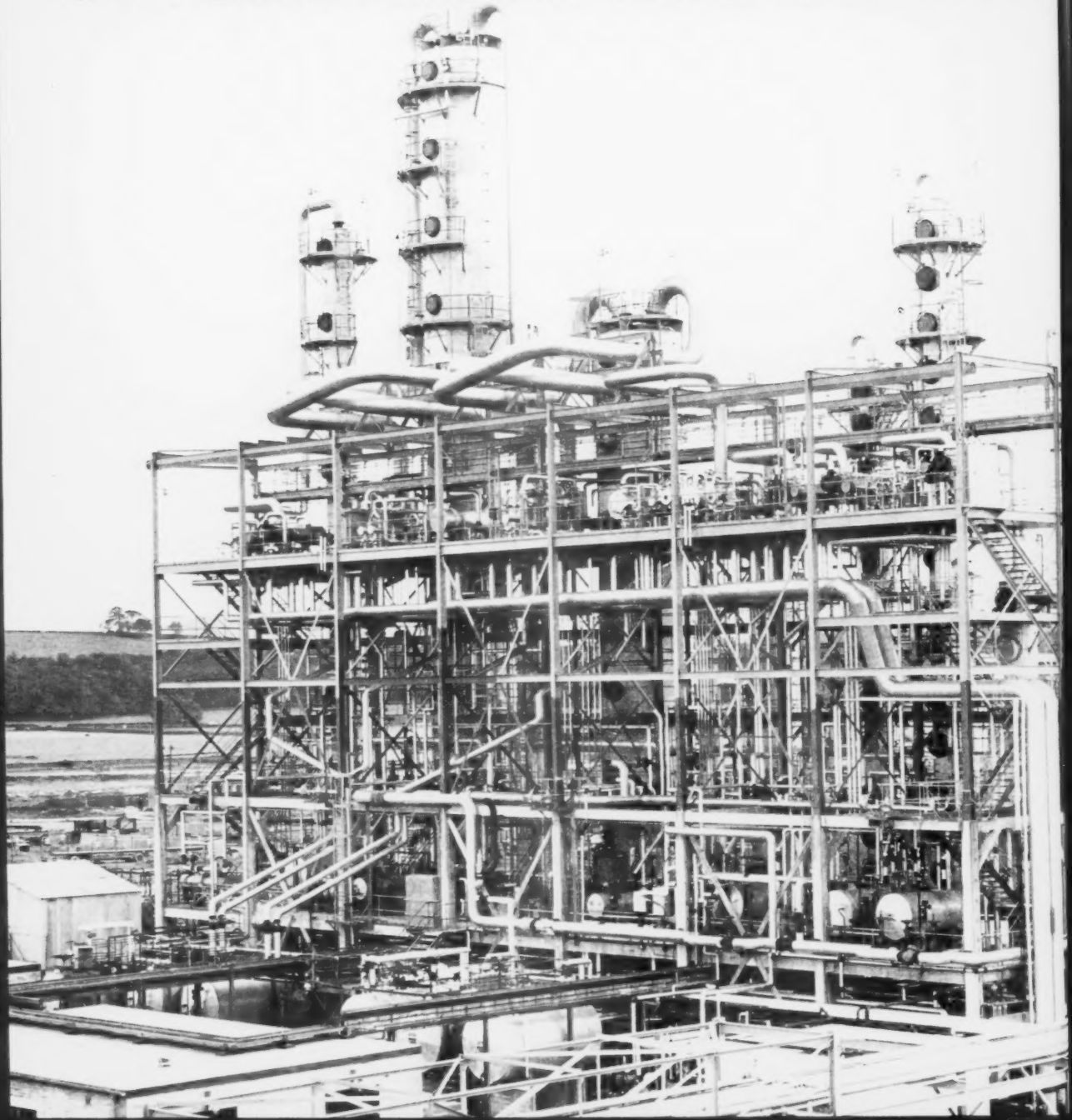

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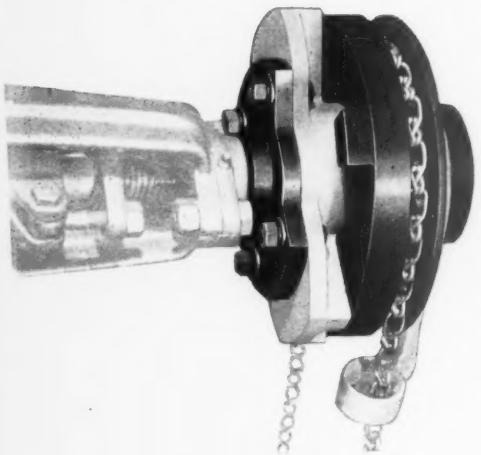

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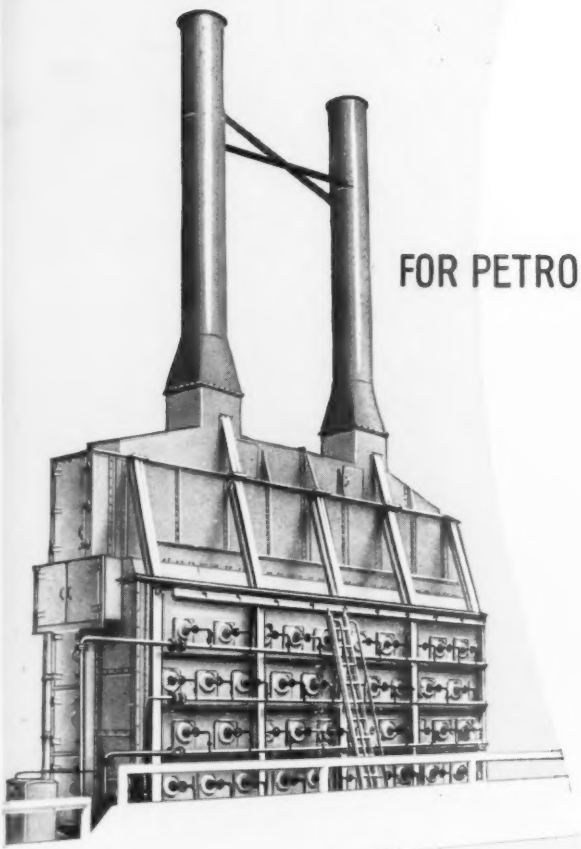

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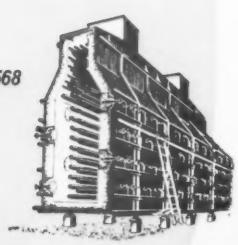

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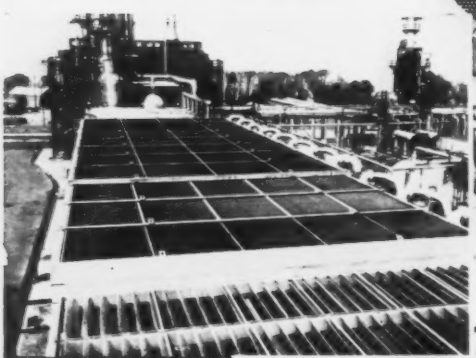

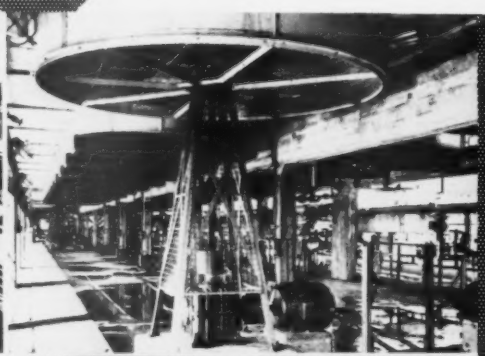

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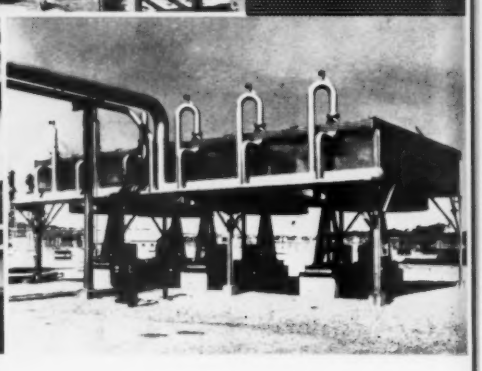

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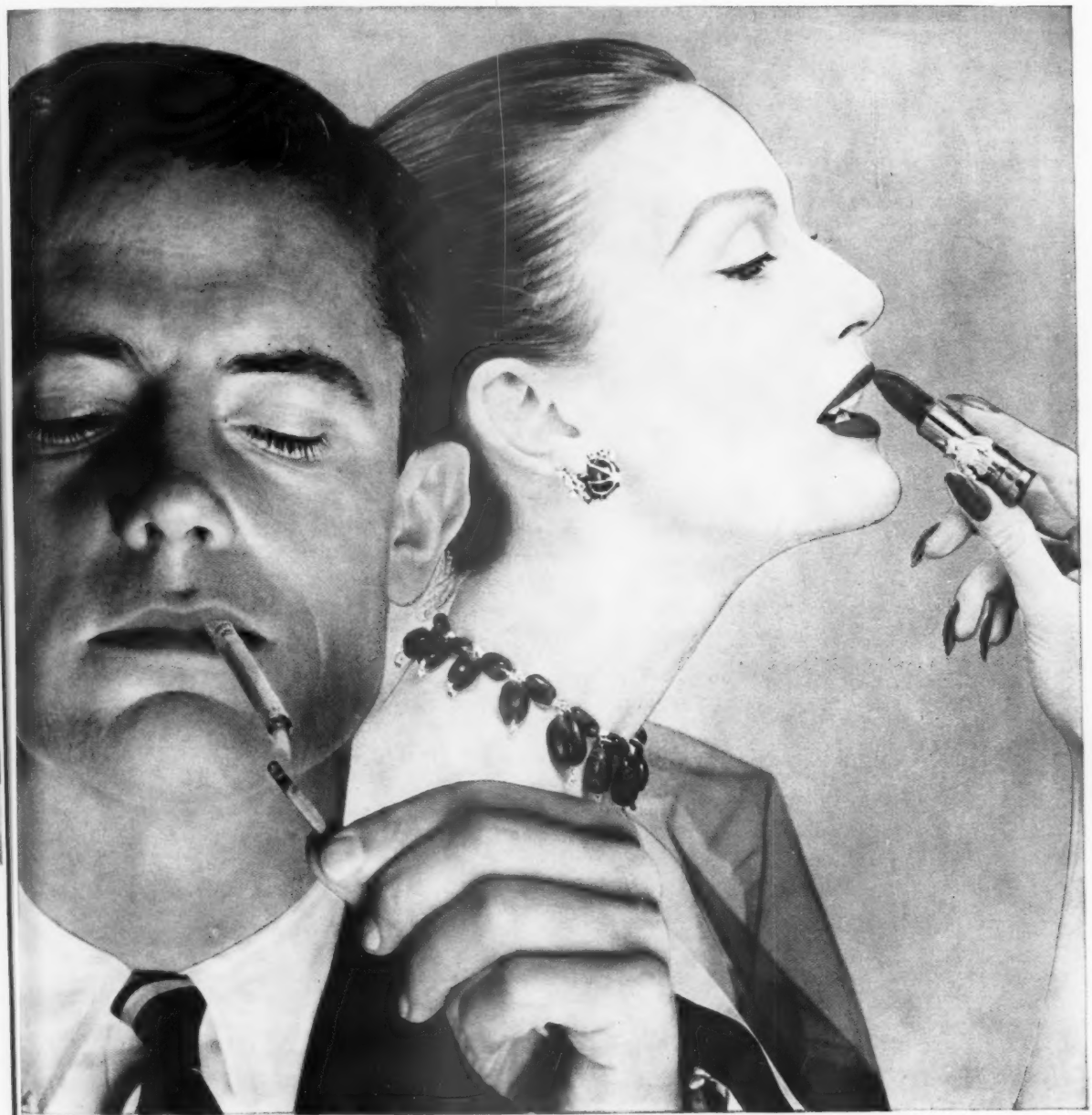

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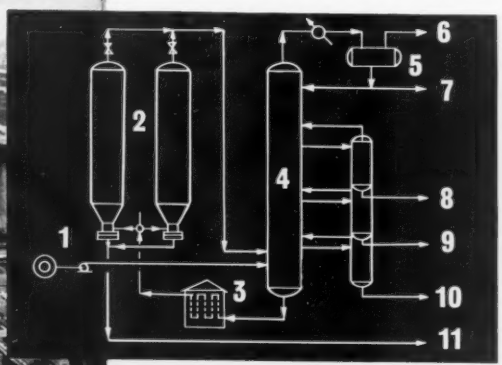

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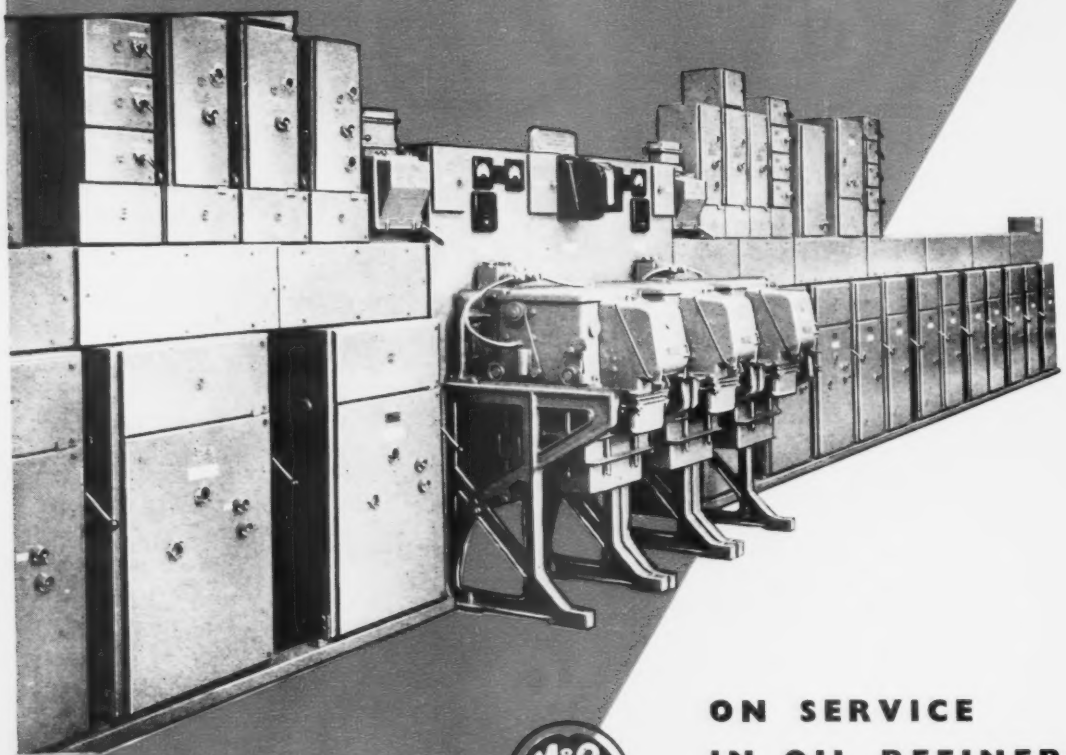

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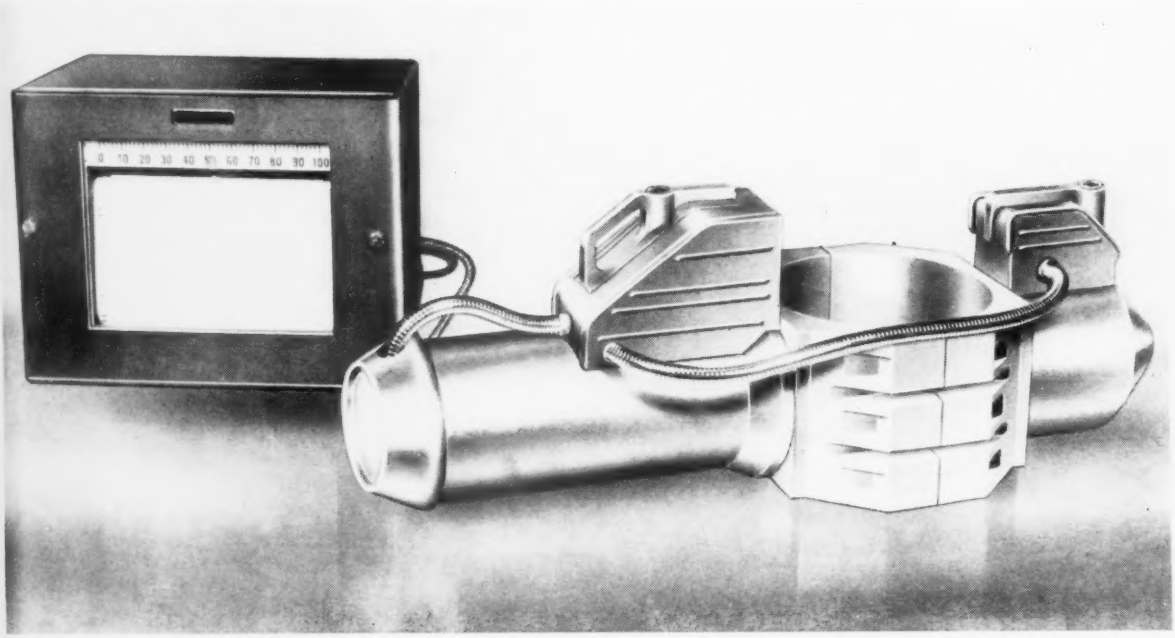

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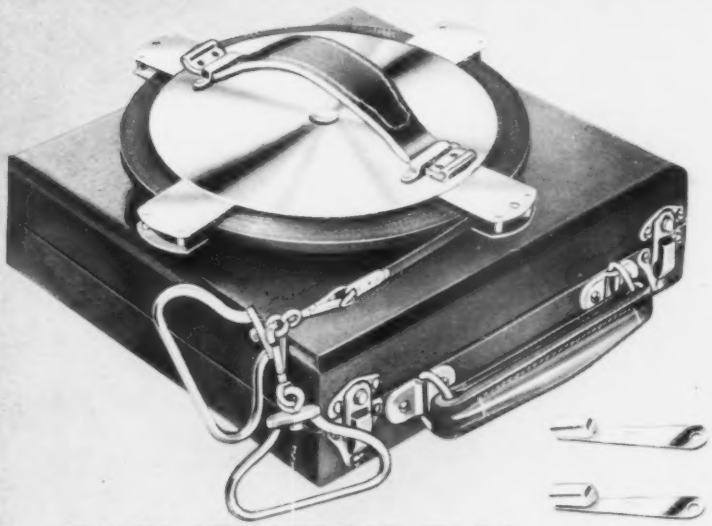

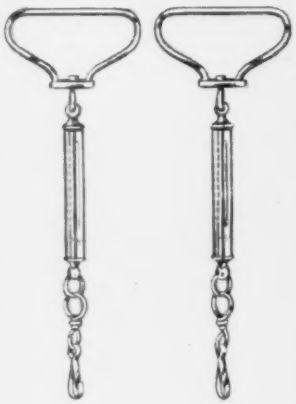

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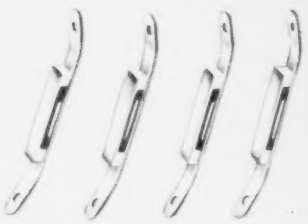

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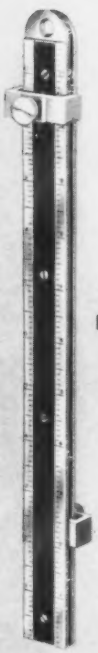

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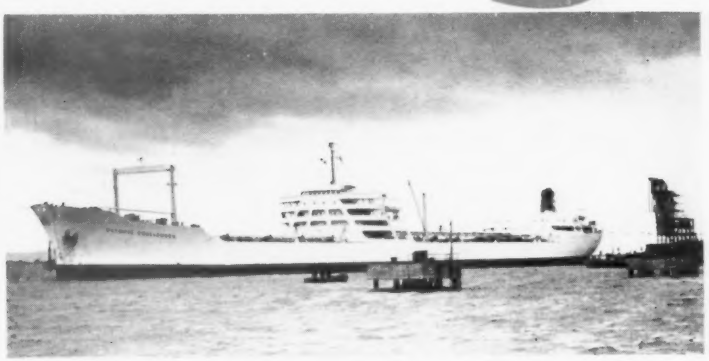

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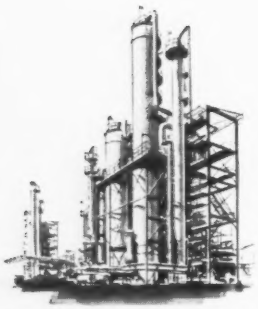

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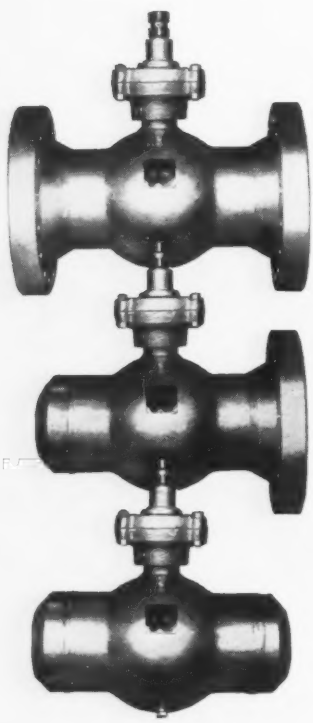

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*Development at Wilton**

by G. M. POWER†

In the 19th Century the lives of most people were able to proceed almost completely undisturbed by the Napoleonic Wars. In the 20th Century there is hardly any aspect of life, conditioned by technical and technological advances, which remains unaffected by the world war conflicts experienced in the first half of this century. Two most significant factors in wartime are the stimulation of technical and technological expansion under the over-riding demands of the situation, and the inevitable side-tracking of normal peacetime developments. This results in an accumulation of technical developments and a reservoir of new technical information acquired during the war which are available and ripe for exploitation as soon as reversion to peacetime conditions will permit. The classical example in the chemical industry after the first world war is the manufacture of synthetic ammonia and nitrates. Examples from the second world war period will come readily to mind.

ICI was well aware of these two aspects of wartime conditions and, when time permitted during the later years of the second world war, considered what its policy should be about post-war development. Amongst the possibilities considered, which included expansion inside existing factories, and development of new factories near those existing and closely integrated with them, came the idea of developing a large new site for the manufacture of new products closely integrated within themselves.

The new site was envisaged as the home of chemicals based on petroleum and of the development of synthetic fibres, *i.e.* nylon and what is now known as "*Terylene*". This is still the essential basis of chemical production at Wilton, the first of ICI's new post-war chemical factories to be developed.

The general basis for the new factory site was: about 2000 acres of good building land, preferably in a development area; good road and rail access; deep water access; plentiful cooling water; and the proximity to coalfields and salt and anhydrite deposits. Other factors, *e.g.* drainage, proximity to markets, availability of labour, amenities for employees, were not overlooked.

A number of sites, on Merseyside, on the Humber, and on Tees-side, were examined, and the choice was finally made of the Wilton site towards the end of 1945.

The industrial site at Wilton had a total area of 2000 acres of good, reasonably flat, land. There was road access on the north and south sides of the site, connecting with the Great North Road some 20 miles away; the railway to Darlington on the main London-Edinburgh line was close by to the north of the site; the port facilities on the Tees Estuary were good; and the Tees Conservancy Commission was planning new docks. Coal was near at hand in Durham; there were developed salt and anhydrite deposits in Durham, and further deposits were anticipated (and subsequently proved) in and around the Wilton site. There was the estuary for cooling water, and the Tees Valley Water Board had plans for extending the fresh water resources of the Tees watershed. Tees-side was a development area, and hence there was Government encouragement for new industries.

Work on the Wilton site began in 1946, and the first chemical plant came into production in September 1949.

The proximity of Wilton to the Company's factory at Billingham has resulted in a close technical connexion in some fields of development, the physical form being the 10-mile pipeline link, including a tunnel under the Tees Estuary, by which gases and liquids are interchanged between the two sites. These connexions, and also the close integration of the chemicals manufactured at Wilton, will become apparent in the general description of the Wilton plants which follows.

The basic raw material for the petroleum chemicals activities which have been developed at Wilton is light naphtha. This feedstock is cracked in the olefin plants with the primary object of producing the olefinic gases ethylene and propylene. The first olefin plant which started up in 1951 was capable of cracking 250,000 tons a year of feedstock; two further similar olefin plants have been built since then, and at present some 550,000–600,000 tons/year of feedstock are being cracked and 110,000 tons/year of ethylene are produced.

The oil feedstock is brought into the Tees in ocean-going tankers, and off-loaded at oil wharves at Teesport built by

*Presented to the Fawley Branch on 11 November 1959.
†ICI Ltd.

the Tees Conservancy Commission. The pyrolysis is accomplished by vaporizing the oil and mixing its hot vapour with steam at a much higher temperature, this method of operation being designed to give high yields of olefinic products. The heat in the products from the reaction is utilized, as far as is practicable, for raising steam in waste heat boilers, and the products of pyrolysis pass into a primary fractionator where condensed steam and a small amount of heavy oil are removed. After compression the gases pass through a purification train for removal of hydrogen sulphide, water, and acetylene, and into a warm fractionation system where motor spirit and butylenes plus butadiene are separated. Finally, there is a train of fractionating columns operating at low temperature where the remaining light hydrocarbon products are separated. Of these products the lowest boiling is the "tail gas" containing hydrogen and methane. This is pumped to Billingham, and the hydrogen is used in hydrogenation reactions.

The ethylene produced is of high purity, and is used at Wilton in the manufacture of polythene and of ethylene oxide. It is also liquefied and transported by road to other consumers.

The majority of the propylene stream, which is 95 per cent pure propylene, is pumped to Billingham, but some is used at Wilton in the production of propylene oxide and propylene glycol. A substantial additional usage at Wilton will follow the commissioning of the plant now nearing completion for conversion of propylene to "*Propathene*" grades of polypropylene.

Hydrogen from the hydrogen/methane tail gas sent to Billingham is used together with hydrogen from other sources in hydrogenation processes in which ammonia figures largely. One of such processes is the production of methanol, some of which is transferred to Wilton. Much of the propylene is reacted with water to form *iso*propanol, the majority of which is dehydrogenated to acetone, an important material in the paint and explosives industries. Acetone is also a major raw material for the manufacture of methylmethacrylate at Billingham, and this product also is transferred to Wilton. The methylmethacrylate is the monomer from which "*Perspex*" acrylic sheet is made, by polymerizing the material between sheets of glass to give the familiar clear or coloured "*Perspex*". Methanol is converted to formaldehyde by the catalytic air oxidation process at Wilton, and the formaldehyde produced is used along with urea, also from Billingham, in the manufacture of "*Mouldrite*" urea-formaldehyde moulding powders. These moulding powders are the materials from which are produced, by moulding under heat and pressure, the familiar ash-tray, electric light switch, control knob, bottle-cap, etc

The ethylene produced in the olefin plants is the raw material for the production of the "*Alkathene*" grades of polythene in plant capable of an output of 90,000 tons year by the high-pressure process invented by ICI. Its toughness, flexibility, and water resistance, its chemical inertness, and its first-class electrical properties, have led to the development of so many uses that it is now becoming difficult to imagine a world without polythene.

The remainder of the ethylene used at Wilton goes into the production of ethylene oxide, the chlorohydrin route being used. Ethylene, chlorine, and water are reacted to produce a 4–5 per cent solution of ethylene chlorohydrin, which is hydrolysed with hot lime to give ethylene oxide. The impure ethylene oxide stripped off is fractionated, by-product ethylene dichloride and dichlorodiethyl ether being recovered. Ethylene oxide is of little direct commercial interest, and is made at Wilton mainly for conversion into ethylene glycol and into a synthetic detergent "*Lissapol*". The glycol is produced by direct hydration of the oxide under pressure at about 200 C, the resultant solution being concentrated by evaporation and distilled with recovery of diglycol and polyglycols.

The non-ionic liquid detergent "*Lissapol N*" is produced by condensing ethylene oxide with alkyl phenols supplied from Billingham.

There are two important links between ethylene oxide and

This view of the Wilton works shows the polythene plants with olefin and other plants in the background

other major plants at Wilton. The first is in the production of ethylene oxide, the chlorine required therefore being made at Wilton, and the second in the use of the oxide, as ethylene glycol produced therefrom is one of the two major raw materials in the production of "*Terylene*".

Chlorine is produced electrolytically at Wilton from brine which is pumped from the wells north of the Tees through a pipeline in the link. The manufacture of electrolytic chlorine is accompanied by the production of caustic soda and hydrogen. The hydrogen is used in the manufacture of nylon. The processes of nylon production involve two main hydrogenation stages for the production of its constituent 6 carbon aliphatic compounds, adipic acid, and hexamethylene diamine (HMD). The first is the hydrogenation of benzene to *cyclo*hexane, which on fission of the ring by oxidation gives the basic 6 carbon aliphatic structure. The second is the hydrogenation of adiponitrile to HMD. The first 10,000 tons/year nylon polymer plant at Wilton is now in full operation, the polymer being produced from equimolecular parts of adipic acid and HMD.

Hydrogen is also used at Wilton in the production of alphanaphthylamine, a dyestuffs intermediate made by nitrating naphthalene and catalytically reducing the nitro naphthalene. Another important naphthalene product is phthalic anhydride, a major material for the paint and plastics industries. This is produced at Wilton by the air oxidation process using a fluid bed catalyst, followed by purification and flaking of the product.

Reference has already been made to ethylene glycol as one of the two main raw materials in making "*Terylene*". The other is *p*-xylene, which is produced at Wilton from a concentrate of aromatic hydrocarbons containing 8 carbon atoms, *i.e. o- m-* and *p*-xylene, and ethyl benzene. The isolation of p-xylene from this mixture is done by freezing, and the stripped mother liquor is passed through an isomerization plant in which the initial balance between the three xylene isomers is largely restored and recovery of more *p*-xylene is rendered possible.

In the "*Terylene*" plant the *p*-xylene is converted first to terephthalic acid, which after rigorous purification is condensed with glycol to give the polyester from which "*Terylene*" fibre is spun. The first units of this plant went into production early in 1955, and various extensions have been made increasing plant capacity to over 40 million lb a year. In the first stage of the spinning process molten polymer is extruded through holes in spinnerets and hardens into very fine filaments. These are drawn to develop the fibre's full strength, there being two distinct ways of doing this according to the type of fibre being made. In the case of continuous filament yarn, which makes up into materials with a silky finish, the number of filaments appearing in the yarn are spun at the same time, then drawn, and then twisted together. Only part of the "*Terylene*" is produced in this form; the remainder is made as staple fibre, for which many filaments are spun at one time, the product from many spinnerets is combined and the whole group drawn at one time. This is possible because no twist is to be imparted to the fibre, but it is to be crimped and then cut into lengths similar to those of natural fibres such as cotton and wool. The staple fibre is then spun by the consumers in the fashion employed with natural fibres, the "*Terylene*" being used by itself or in blends with natural fibres. The yarns so produced make up into fabrics quite different from those made with filament yarn.

The last of the Wilton plants currently in operation to be mentioned are the butadiene and the "*Buktakon*" plants. Butadiene is extracted from the C_4 fraction from the olefin plant and is co-polymerized with various monomers to produce a range of rubber-like plastics under the trade name "*Butakon*" for uses ranging from emulsion paints to shoe-soling compositions.

The chlorine and "Terylene" works are on the left of this picture

This then is the chemical pattern of Wilton works as far as it has developed, a pattern in which high polymer chemistry is widely represented.

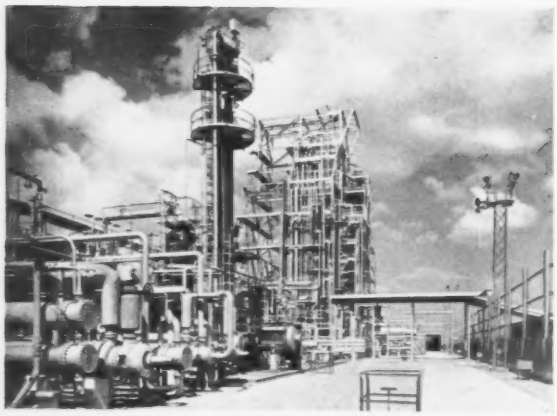
With the development of production of the various chemicals which have been outlined the factory has grown for the past ten years until it now occupies about 600 acres, *i.e.* about one-third of the industrial site. Layout has been generously designed so that there is ample space for logical growth, and the density of accommodation of the 600 acres is by no means as high as, for example, at the Billingham factory. The total capital expenditure amounts to date to over £110 million; the rate of expenditure has averaged about £10 million in a year, but the annual rate has naturally varied a good deal, from £400,000 in 1946 to £5 million in 1950, £15 million in 1957, and the peak of over £16 million in 1958. Current expenditure is closer to the average rate.

A chemical factory of this scope has large requirements for steam, electricity, water, and other services. Steam and electricity requirements are supplied from a central station where steam is generated at pressures considerably higher than generally required for process use, and with electricity generated in letting down high-pressure steam to process pressures.

The central station has five coal-fired high-pressure boilers. The first three of these have capacities of 120 *tes*/hr of steam raised at 930 psi; the other two boilers have a capacity of 240 *tes*/hr of steam raised at 1700 psi. Coal consumption is now about half a million tons a year. The steam is exported to the factory at three pressures, high-pressure steam at 900 psi, intermediate pressure steam at 250 psi, and low-pressure steam at 20 psi. The steam export is associated with turbines operated at suitable back pressures, with a small proportion of condensing capacity to enable the required balance of steam and electricity generation to be maintained.

The total capacity for electricity generation is 116,000 kW from four primary and two secondary turbo-alternator sets.

Wilton works, in common with all large chemical factories, requires vast quantities of water for cooling, for process use, and for boiler feed, in addition to that required for domestic purposes. These water supplies are drawn wholly from the Tees Valley and Cleveland Water Board. Estuarine water



No 3 olefin plant with a view of part of gas separation plant

could be drawn from the Tees for cooling purposes, but it is highly saline and potentially corrosive. Its use compares unfavourably with the use of circulating cooling systems with cooling towers and fresh make-up water. Wilton employs a modern type of tower consisting of multiple small induced draught units developed at Billingham. Make-up water for these cooling systems, and also for the less exacting demands of chemical process, is obtained from the River Tees at Worsall, 12 miles away, where the Water Board operates a pumping station of 9 mgd capacity. Treatment is limited to coarse screening and chlorination.

Water for domestic purposes, for boiler feed, and for high-quality process requirements, comes from the Water Board's public supply, the take being about 2 mgd. For make-up to the feed to the high-pressure boilers water is demineralized, and silica is also removed using ion exchange processes. Condensate return from the factory is low and the make-up averages about 65 per cent of the total feed to the boilers. The growth of Wilton's water requirements, together with those of other Tees-side industries—notably Billingham and the steelworks—have required major extensions of the Water Board's resources. In particular there has been the construction of a major new reservoir in the gathering grounds, due to be completed this year, and plans for a further reservoir, completion of which will take place in 1966.

Time is too short to deal even briefly with other piped services such as compressed air, nitrogen, and town gas, or to touch on more than a few of the engineering or commercial services provided.

On a site of the size and complexity of Wilton, with a large and growing programme of plant maintenance as well as a construction programme spreading over many years, engineering workshops are essential, and provision was made very early in the development of the site for central workshops. The primary job of these workshops is to carry out maintenance jobs too large or complex for handling in local plant shops, and which cannot be accomplished with the required speed or economy by placing orders outside the factory.

The workshops have been developed in stages as the factory has grown, and the mechanical workshops area amounts to about 150,000 sq ft, and are equipped with the widest variety of tools and equipment to enable the work to be carried out rapidly and with high productivity. Other workshops are concerned with the maintenance of instruments and electrical equipment.

Amenities and welfare provision cover all the accepted facilities in a modern factory, such as changing rooms and toilet facilities, messrooms, medical services, recreation, etc. The canteen facilities may be taken as one instance. There are six canteens on the site, all of which serve staff and payroll. These can feed about 3000 people at a time, and are adequate to meet the requirements of day personnel of whom about 60 per cent use the facilities provided. Both cafeteria and waitress services are provided, and the canteens are so located on the site that there are few people who have more than five minutes walk from their workplace to a canteen.

It is hardly necessary to emphasize the importance of training in industry—not only the training of craft apprentices but of training for promotion, and training in the techniques required for operation and maintenance of more and more complex chemical plants. In the early days of Wilton a training school was set up to train craft apprentices to meet the demands for tradesmen as the factory expanded. This nucleus of a training school has now been expanded to serve all sections of operation and maintenance. A major part of the work is still the training of craft and student apprentices, both in the school and on the works. In addition, there are courses for staff and for payroll, for introducing newcomers to the factory as a whole, for plant operatives and potential and new supervisors, for engineering graduates, and for laboratory assistants. The application of work study to factory operation in its widest terms is also taught extensively. In the past four years the number of apprentices completing training in a year has increased from 25 to 50, and there are currently over 500 apprentices in training. The training centre has a staff of about 35, and runs well over a hundred courses a year.

* * *

MIDDLE EAST OIL PRODUCTION

	October	*Jan-October*
	Tons	
Iraq Petroleum Co. Ltd ...	3,075,134	27,885,113
Basrah Petroleum Co. Ltd ...	1,069,935	9,617,167
Mosul Petroleum Co. Ltd ...	110,202	1,084,895
Qatar Petroleum Co. Ltd ...	724,315	6,781,553
Iraanse Aardolie Exploratie en Productie Mij	4,966,000	41,593,000
	Barrels	
Arabian American Oil Co. ...	41,109,756	373,537,391
Bahrain Petroleum Co. Ltd ...	1,397,788	13,747,781
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone)	4,638,816	40,507,036

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for October was 1,460,000 tons, the total for 1 January to 31 October being 14,148,000 tons.

Crude processed at Aramco's Ras Tanura refinery during October was 5,535,664 brl, the total for 1 January to 31 October being 66,904,938 brl.

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Stanlow Branch

W. M. Hare delivered a talk on "Industrial Engineering in an Oil Refinery" to the Stanlow Branch on Friday 23 September.

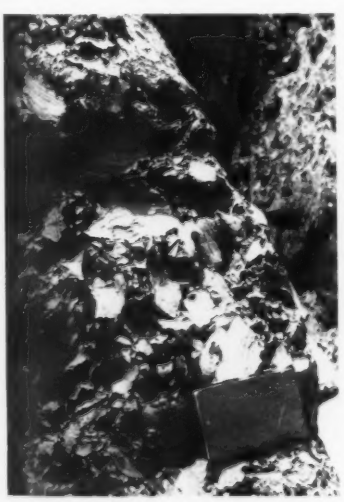
He commenced by defining industrial engineering as the scientific approach to all factors, including the human factor, in the production and distribution of products or services and explained how this embraced the techniques of works study.

A brief resumé of the type of studies carried out by the Stanlow Industrial Engineering Department was then given, followed by a more detailed talk on a representative sample of these studies.

The examples covered a wide variety of refinery activities such as plant operations, general layouts of road and rail filling facilities, design production studies, packed lubricants and chemicals, project development and the realm of paper work; these studies gave a clear picture of what savings had been achieved in both human and material resources.

Trinidad Branch

The Trinidad Branch held a second geological excursion on 25 September following the popularity of an earlier one held in March. The excursion, with 26 members and guests present, was organised by Messrs Barker and Higgins and had as its starting point the famed Asphalt Lake at Brighton. A short introductory talk was given on the relevant and factual data of the lake; its probable discovery by Columbus—with passing acknowledgment to Sir Walter Raleigh, size, depth, chemistry, production, etc., followed by views on its probable origin. Thereafter the party spread out under a hot sun over the lake to examine its main features, the asphalt, and the so-called asphalt earth.



Exposure of "clay-pebble" bed near Vance River

Then the party moved on to one of the multi-well sites on the western coast of Brighton where excavations had exposed one of the many tongues of asphalt which occur interbedded in the Morne L'Enfer formation which rims

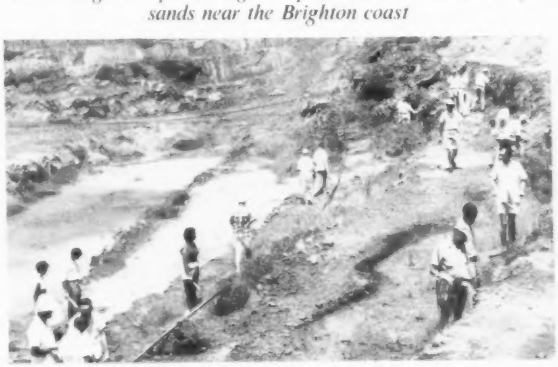
The party in the centre of the asphalt lake

the lake. Typical asphalt and "onion-skin weathered" asphalt earth were seen here. Subsequently members were taken through the Vessigny Field to the classic type locality of the oyster—Crassostrea virginica falconensis—a marker fossil for Pliocene in Trinidad; its size puts the local Trinidad oyster to shame, but the latter has its own merits and it isn't the "biggest as is always the best".

From Vessigny the party walked along the Vance River coast section with its exposure of Morne L'Enfer sands and silts and fine examples of contemporaneous clay (silt)-pebble bands 10 to 15 ft thick with pebbles and slabs up to 18 in in length. Some lignites with *in situ* roots exposed and associated porcellanites (burnt clays) were also seen. By this time demands of the flesh were in evidence and the party returned for lunch, as guests of the Texaco Brighton Club.

Following lunch and to close the day the members were taken to Shell Point Fortin offices, via an excellent exposure of Morne L'Enfer oilsands at the Stollmeyer Quarry near Guapo. At Point Fortin the party were able to relax comfortably in the air-conditioned offices whilst Geo. Sung gave a brief historical and geological review of the Point Fortin area, outlining its development and general structure, etc. Members were thereafter guests of the Shell Point Fortin Club and were able to enjoy the amenities of the pool and air-conditioned bar to make a pleasant end to an enjoyable day.

Examining an asphalt tongue exposed below Morne L'Enfer sands near the Brighton coast



Scottish Branch

Dr W. B. Peutherer, chairman of the Branch, presided at a meeting on 10 November in the recreation hall of BP's Grangemouth refinery at which he introduced Professor A. D. Walsh, Baxter Professor of Chemistry at Queen's College, Dundee, in the University of St. Andrews.

Professor Walsh gave a talk on "The Mode of Action of Tetraethyl Lead as an 'Anti-Knock' in Petrol Engines." He said that the development of flying during the 1914-18 war first lead to the realization that "knock" was one of the major factors limiting the power output and efficiency of spark-ignition engines. Kettering, Midgley, and Boyd, working in the laboratories of the National Cash Register Co in Dayton, Ohio, were the first to show that chemical "anti-knocks" existed. Their work was interrupted by the entry of the U.S.A. into the war; but when continued again at the close of the war (this time in the laboratories of the General Motors Co.), it led to the discovery of the outstanding "anti-knock" properties of tetraethyl lead.

Professor Walsh went on to tell the story of the discovery in full, because as he said, it provided an excellent example of the proper regard of hypotheses in scientific progress—not as ends in themselves but always as stimuli to further experimental work.

Motor spirit containing tetraethyl lead was first marketed (at Dayton, Ohio) in 1923; and its use spread rapidly. But although a great industry arose from its production and sale, it was remarkable that very little fundamental research on the mode of action of the compound was published between the two world wars. It was not that fundamental research was not attempted, but that a variety of difficulties led to the abandoning of each attempt.

Professor Walsh first became interested in the problem during the 1939-45 war and he described the stumbling progress made in encountering and overcoming the difficulties. That any progress at all was made was essentially due to learning the lesson implicit in the work of Kettering, Midgley, and Boyd: namely that explanatory hypotheses need to be set up at each stage of research but must be regarded primarily as stimuli to further experiments.

The conclusion was reached that TEL was an "anti-knock" because it formed a fog of PbO particles. The conclusion was very strongly suggested by the evidence, though it was only fair to add that one group of workers did not accept the conclusion. The "anti-knock" action was due to the surface properties of these particles, particularly to their ability to destroy HO_2 radicals and H_2O_2 molecules. This ability was in turn due to the ease of an electron transfer from the PbO surface to an absorbed HO_2 radical or H_2O_2 molecule. The conclusion led to the corollary that it may be possible to achieve more powerful "anti-knock" action via the formation of a fog of oxide particles whose surfaces contained more than one metal. This corollary, although first put forward by the author eight years ago, had not yet been adequately tested.

Yorkshire Branch

At the Yorkshire Branch meeting on 9 November, G. J. C. Vineall, chairman of the Branch introduced J. E. James and J. N. Randle of Morris Motors Ltd, who gave a talk on "The Testing of Materials in Automobile Production". Mr James is chief chemist and metallurgist and Mr Randle is a research chemist in the Nuffield research organization.

Mr James explained how the Nuffield organization and BMC test all materials they use for motor vehicle manufacture and products such as fuel and lubricating oil used in the vehicles. The tests cover a very wide field, due to the great variety of materials used in the manufacture of the modern motor vehicle. All materials are tested against a specification and where British Standards are available these are used. In many instances, the organization has devised its own tests and specifications for various materials which have been very useful in obtaining uniformity of supplies. Initial supplies of a material undergo extensive testing, but repeat supplies receive routine tests only.

The large number of test procedures which are carried out on a variety of materials ranging from steel and other metals, to rubber, plastics, brake fluid, lubricants, etc., were explained. Tests vary from those for tensile strength to weathering of coach finishes, which employ a great variety of equipment, including radio-active isotopes. Most of the procedures carried out were illustrated with slides and samples of materials which had undergone testing were shown.

Fawley Branch

About one hundred members and guests of the Fawley Branch gathered at The Potter's Heron, Ampfield, on 25 November 1960 for the Branch Dinner-Dance. Following an excellent meal, the guests were welcomed by Dr F. Mayo, the Branch chairman, and the President of the Institute, Julian M. Leonard, expressed the thanks of the guests.

During the dancing period an entertaining cabaret was presented by members of the Branch. With Ian Hinton as compere, Rod Hall at the piano, and Ken Gladstone-Millar on the percussion bank, there were songs and dances by Betty Briscoe and Heather Russell, and alto-saxophone solos by Les Corlett. In addition to his duties as compere, Ian also recounted in song the modern trials and tribulations of the Monks of Beaulieu.

The Potter's Heron was a new venue for the Fawley Branch dance and the event was voted "first class" by all present.

THE FAWLEY BRANCH AT THE POTTER'S HERON

(Left) *Members of the Branch and their guests were welcomed by the Branch Chairman, Dr F. Mayo, and the Institute's President, J. M. Leonard* (right), *expressed the thanks and pleasure of the guests*

Photos by Ian Hinton and George Sell

THE SOUTH-EASTERN BRANCH MAKES MERRY

The 1960 Annual Dinner-Dance of the Branch was held on 11 November and on this occasion the venue was the Royal Star Hotel, Maidstone. A record gathering of some 300 members and their guests spent the evening on and off the dance floor. When the National Anthem was played at 1 a.m. the unanimous opinion was that the high standard set on previous occasions had been well maintained. Evidence of this is provided by the pictures from the editor's camera reproduced above. Top left is seen the chairman of the Branch, C. Billingsley, with Mr and Mrs F. W. Martin. Mr Martin was a member of the Branch Foundation Committee. As a memento of the occasion, each lady was presented with a gift. A raffle was also held on behalf of a local charity and the prize, an electric blanket, was won by A. P. Shirley who, from the photo of the presentation (*bottom right*), was obviously looking forward with much pleasure to a warm time. In the absence on account of indisposition of Mrs C. Billingsley, the prize was presented to the winner by Mrs F. W. Martin.

Much of the success of the event was due to the efforts of a special committee set up to organize the event. Members of this committee were R. Brown, F. W. Martin, and C. Taylor, and they are seen (*left to right*) with their wives (*top right*).

South Wales Branch

The annual Branch visit was held on 28 September when a party of members was taken on a tour of the Velindre works of the Steel Company of Wales.

They saw the fascinating processes involved in the manufacture of tinplate from steel coils. These included rolling, annealing, shaping, tinplating, and packaging. They also visited the rolls repair shop and at the conclusion of the tour were entertained to tea.

Postal Services Mechanization

On 20 October, the Branch was given a talk by C. T. Lamping, A.M.I.E.E., on "The Mechanization of the Postal Services", at the BP Refinery (Llandarcy) Training Centre.

Mr Lamping began by referring to the enormity of the task that confronted the Post Office. He said that they dealt with an average daily post of 26 million items. These could include anything from bulky parcels to small envelopes. The difficulties in sorting could be more appreciated when it was realized that there were 67 types of envelope approved by the BSI.

A number of interesting films and slides illustrated both the former manual methods and the new automatic methods. It was most interesting to watch the automatic machines sorting letters from packets and then preparing the letters for franking and finally separating them according to their destinations.

The main block of the Chemical Engineering Department

Birmingham University Chemical Engineering Department

With the retirement at the end of September last of Professor F. H. Garner, O.B.E., from the Chair of Chemical Engineering at Birmingham University, a position which he had held since 1942, *it is appropriate that we should record, even if briefly, the almost fifty-years history and achievement of the Department.*

The Department of Chemical Engineering of Birmingham University was inaugurated in 1911–12 by Professor John Cadman (later Lord Cadman) who was then Professor of Mining. At that time he established a degree course in Petroleum Technology, with himself as head of the school. The emphasis was on "oil mining" and "refining" and in 1912 a well-drilling rig was ordered, and a drilling instructor was appointed in 1913. At first the course was a three-year one leading to the B.Sc. degree.

The work of the school was interrupted by the first world war but was revived in 1920–21 and in 1925–26 a separate Department of Oil Engineering and Refining was established, with Professor A. W. Nash as its head. At this juncture the Department secured its own building which was built and equipped at a cost of £17,000. For comparison it might be noted that the new building recently occupied by the Department cost some £200,000 or about £4 per square foot.

From about 1924 marked increases took place in refining activity and in development of refining processes and these led to greatly increased demands for personnel qualified in the principles of chemical engineering. This in turn lead to gradual change in emphasis in the Birmingham course from the production side to refining. By 1930 the Department was very actively engaged in chemical engineering research.

It was in 1946 that a major and fundamental change in the Department took place. In that year it took over the Coal Utilization Section of the Mining Department and became the Chemical Engineering Department of the University. As a consequence of these changes the course was reorganized into two separate sections—Chemical Engineering and Petroleum Production. The *exploitation* part of the course was transferred to the Geological Department and students of geology who were interested in petroleum were given part of the Petroleum Production course.

A more recent development has been the foundation of two post-graduate schools leading to an M.Sc. degree by examination in either chemical engineering or in biological engineering. In addition to the

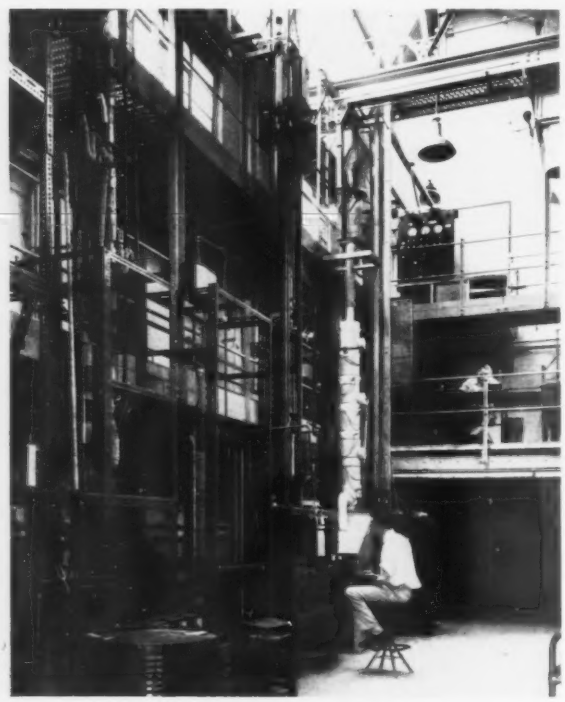
A general view in the third-year teaching laboratory

diploma course in chemical engineering, a similar course in petroleum production is to be set up shortly.

Staff

As already mentioned, the head of the first School of Oil Mining and Refining in 1911–12 was Professor John Cadman. When the school was revived in 1920–21 after the first world war and while it was still part of the Mining Department, Sir John Cadman (as he then was) remained as its Honorary Professor and head with Professor T. G. Madgwick leading the Petroleum Course as assistant professor. Professor Madgwick was succeeded in 1922–23 by Professor R. R. Thompson, and a year later Professor A. W. Nash was appointed and remained in charge until his death in 1942. He was succeeded by Professor F. H. Garner, O.B.E., whose successor is Professor J. T. Davies.

When the Chemical Engineering Department was set up in 1946, Professor Stacey G. Ward joined it as second professor and in 1949 he was succeeded by Professor Frank Morton. In 1957 Professor Morton went to the school of Chemical Engineering at Manchester College of Science and Technology and he was succeeded at Birmingham by Professor S. R. M. Ellis, a New Zealander.



Inside the research laboratory located in the separate bay

The Chemical Engineering Buildings

The first time that the Department had its own permanent building was in 1925–26 when it became the Department of Oil Engineering and Refining. Here it remained for some thirty years, although during that period there were many changes in and additions to the original structure. In particular, the workshop and third and fourth year practical work studying the unit operations are housed in a separate series of buildings.

A well-stocked library is an essential part of the Department

To-day, the Department of Chemical Engineering is comfortably housed in a modern structure, with at least ten times the floor area of its first building. Work on this building was commenced in November 1953 and most of it was in use three years later.

The building is amply provided with laboratories, some of which are specially fitted to house equipment needed for research and similar investigations. Thus, there are laboratories for radio-active tracer work, rooms with temperature control, while the distillation laboratory occupies one room on each of the ground and first floors, a space in the intervening floor giving head room for columns up to 25 ft in height.

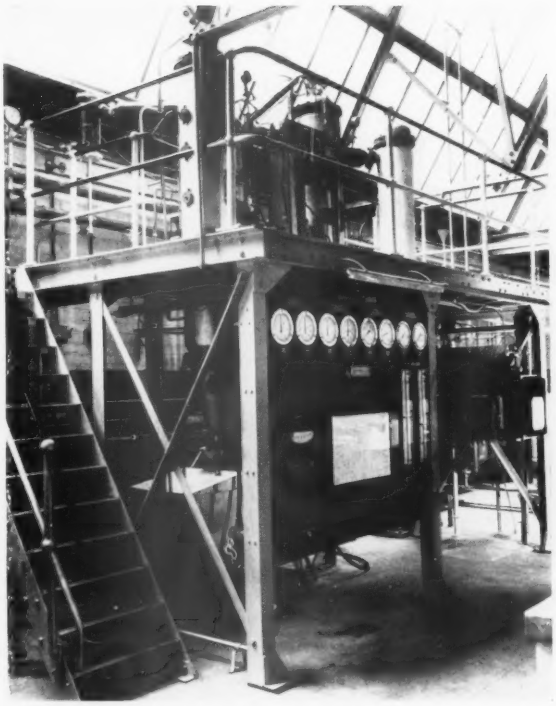
Services to all laboratories are standardized and consist of direct, single- and three-phase current, gas, hot and cold water, and compressed air.

A liquid-liquid extraction plant

Special thought has been given to expansion later, and rooms on the third floor are provided with service ducts so that they can be converted to laboratories if the need arises when a fourth floor is added.

Centrally in the building is the main lecture theatre, a handsome room, panelled in oak and providing seating accommodation for 220 persons. All the latest gadgets for successful lecturing and listening are available, including dual control of all lighting either from the dais or from the projection room. There is also two-way telephonic communication between lecturer and projectionist.

The hand of Professor Garner can be seen in many features in the new building. Apart from the symbolic designs in the entrance floor, there are many examples of alchemic symbols in various pieces of decor.



In the practical course undergraduates work on this double effect evaporator

Pilot Plant Building

Most recent of the additional buildings for the Department is the pilot plant block, at present 40 × 60 ft in area but capable of being lengthened easily when desired. In this building, equipment up to 40 ft in height can be erected, with access at two high levels down one side, one end, and the middle, and at the upper level only down one side.

This building was erected primarily to house the large distillation unit recently donated by the Bahrain Petroleum Company Ltd of the Caltex Group (see *IP Review* December 1960), but has ample room for other units of this type. It also has a small laboratory, accessible only from the outside, which is used for engine combustion research. Another separate laboratory is also used for analytical work in relation to work under investigation in the pilot plants.

Other Buildings

A new biological engineering laboratory has also been built, this being a two-storey block with laboratories for research and teaching. Here the benches are covered with plastic material and the fermenter laboratory, which has vessels ranging in capacity from 5 to 400 litres, occupies both floors of a quarter of the building.

In one laboratory a restricted air circulation cabinet allows for innoculation of broths in uncontaminated air. A flame-proof area is available for extraction and other work with highly inflammable materials.

There are still a few of the older and ancillary buildings in existence and in use for various purposes. These will no doubt in time give way to more modern structures. Meanwhile, they serve good and useful purposes.

Petroleum in Parliament

Esso Bill Passed

It was announced on 10 November that Royal consent had been signified for the Esso Petroleum Company Bill, relating to the proposal to build a pipeline from the Fawley refinery to London airport, and after its third reading the Bill was passed.

Oil and the National Economy

Speaking in a debate on public investment on 9 November, the Minister of Power said that he took a request for a co-ordinated fuel policy to mean that the coal industry should have some protection from oil. The difficulty was that coal did not run motor cars, aeroplanes, or agricultural machinery and he pointed out that seeing how essential oil was to the country's economy, it would be wasteful to make less than the fullest use of all the products produced by refineries.

It was said that Britain's exports of fuel oil were greater than her imports and if there were neither imports nor exports the competition which oil would offer to coal would be even stronger than at present. The Minister went on to say that when all aspects of Britain's international oil trade were taken into account, including carriage and the production of oil equipment, the industry made a considerable and positive contribution to the U.K. balance of payments.

Comparative Figures for Liquid Fuels

The Parliamentary Secretary to the Ministry of Power disclosed in a written answer on 16 November that 820,400 tons of liquid fuels were burnt in the industrial premises of the larger users during September 1960. For the same month of the previous year the figure was 663,000 tons.

Deliveries of kerosine burning oil, and gas/diesel and fuel oil for domestic purposes reached 72,200 tons in September 1960 compared with 51,900 tons in September 1959.

Bulk Storage of Oil

The Minister of Power told the House during question time on 21 November that the charge to his Department for the bulk storage of oil held as a strategic reserve was £3½ million in 1956-57; and £2½ million, £7½ million, and £7 million in the three succeeding years.

An Esso photo

Milford Haven refinery as seen from the south side of the Haven

ESSO'S MILFORD HAVEN REFINERY

Material 99·5 per cent British

Completed in October 1960 the new Esso refinery at Milford Haven, Pembrokeshire, was formally declared open on 3 November by His Royal Highness, The Prince Philip, Duke of Edinburgh, K.G. To commemorate the occasion the Duke unveiled a bas-relief bronze plaque symbolizing a refinery constructor, which had been prepared by Miss Dora Gordine.

Speaking at the opening ceremony, Hugh C. Tett, chairman and managing director of Esso Petroleum Co. Ltd, said that Milford Haven was chosen as the site because it was one of the very few natural harbours in Britain where the largest ships could berth at all states of the tide. The Company was building tankers of around 80,000 deadweight tons.

Stressing the need for high productivity, Mr Tett said that the 330 people, mostly from the neighbourhood, who would be operating the refinery would be working "with an expensive set of tools. Behind each one of them is an investment of over £50,000."

M. J. Rathbone, president and chief executive Standard Oil Co. (New Jersey), proposing the toast "Our Guests", said it was not quite ten years since he had attended the opening of the Fawley refinery. He recalled that about 16 per cent of the materials used there were British. For Milford Haven, the figure had jumped to 99·5 per cent.

The Refinery

The new refinery is sited near Herbrandston, about two miles west of Milford Haven, and in the initial development an area of 350 acres has been occupied. Further acreage is available for expansion. Special efforts were made to preserve the natural beauty of the area.

Designed for a throughput of 100,000 bsd, or 4½ million tons a year, the main products will be motor, jet, and diesel fuels, gas oil, three grades of fuel oil, and propane and butane gases. These products will be distributed by road, rail, or water generally in those parts of Britain west of a line from Inverness to Plymouth.

Total cost was about £18 million and it is anticipated that the crude oil capacity will be sufficient to meet demands at the current rate of increase for about five years.

Process Plants

Process units are grouped in one block and consist of four main items—pipestill, hydrofiner, Powerfiner, and copper chloride sweetening plant.

The atmospheric crude distillation unit, or pipestill, is designed to process Middle East crudes at the rate of 100,000 bsd, with three types of operation to meet varying product requirements. The incoming crude is preheated in an exchanger train before entering the pipestill furnace.

This furnace is the largest of its type in Europe, having a heat release of 465 million Btu/hour. After passing through the furnace, the crude is flashed into the atmospheric column at about 750 F. Overheads from the column are condensed and pass to a feed splitter from which naphtha is taken for storage or as Powerformer feed. Overheads from the splitter are separated into refinery fuel gas and a propane-butane mixture.

Four side streams are taken from the column. The first is partly feed for the Powerformer and partly for the copper sweetening plant. The second is either added to the copper sweetening feed or to the third stream as gas oil feed to the hydrofiner or as a gas oil product. The fourth side stream is

heavy gas oil and the bottoms, after passing through the preheaters, form the basis of the fuel oils.

The hydrofiner is designed to desulphurize 16,500 bsd of gas oil from the pipestill. Process gas rich in hydrogen is obtained from the Powerformer. The sulphur compounds are catalytically reduced to hydrogen sulphide. After separation, the gas goes to the fuel gas system and the gas oil is steam stripped and sent to product storage.

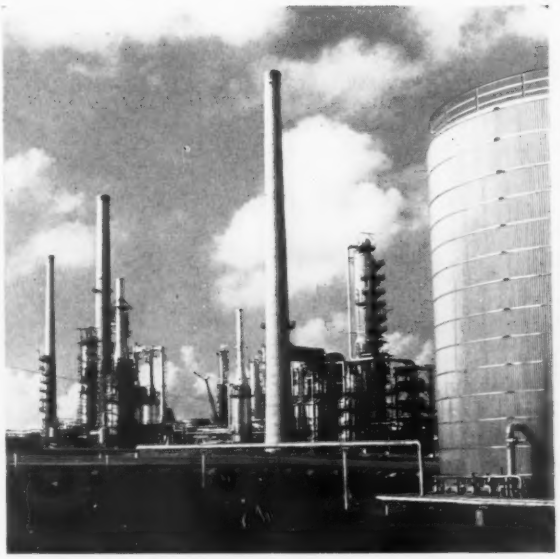
The copper chloride unit treats light and heavy virgin naphtha in parallel streams, capacities being 7800 bsd for the former and 14,900 bsd for the latter. In each case the feed is washed with 5° Bé caustic, coalesced electrically, and steam pre-heated before passing to copper chloride contactors, which are of the fixed bed type. The light naphtha is water-washed and passed to storage. Heavy naphtha is additionally dried in a salt drier after the initial caustic wash, and after copper treatment is again washed with caustic containing 16 per cent by weight sodium sulphide. It is finally coalesced electrically before going to storage.

The complete Powerformer unit, which is designed to treat 14,900 bsd of naphtha, includes a naphtha hydrofiner, a light ends fractionator and caustic washer, a re-run tower, and catalyst reactor. Bottoms from the hydrofiner column are debutanized before passing through the three platinum catalyst reactors and are furnace heated before entering the reactors. The catalyst is reactivated periodically. Gas from the last reactor is separated into two streams, one stream passing to the stripper and the other to the recycle compressor. The liquid product is stabilized and treated to provide propane and butane gases, and refinery fuel gas. Bottoms from the stabilizer provide light and heavy powerformates for blending in motor gasoline.

Three grades of gasoline are manufactured by blending by an in-line blending system. Addition of TEL is made by a packaged unit supplied by The Associated Ethyl Co. Ltd which uses the weigh-tank method of control. Dyes and additives can be injected as required.

Air Cooling

A feature of the refinery is the use of air cooling of all process units. The coolers are of the forced draft type, the fans being either of fixed or variable pitch and of 7 to 12 ft in length. This is the first time a U.K. refinery has been fully air-cooled.



An Esso photo

Crude oil distillation unit, hydrofiner, and Powerformer

Automatic Control

Milford Haven is probably one of the most highly automated refineries in Europe, all continuous processes being operated by remote control from only one process control unit. In a second control room, the liquid level and temperature of every tank in the refinery is electronically recorded.

Utilities

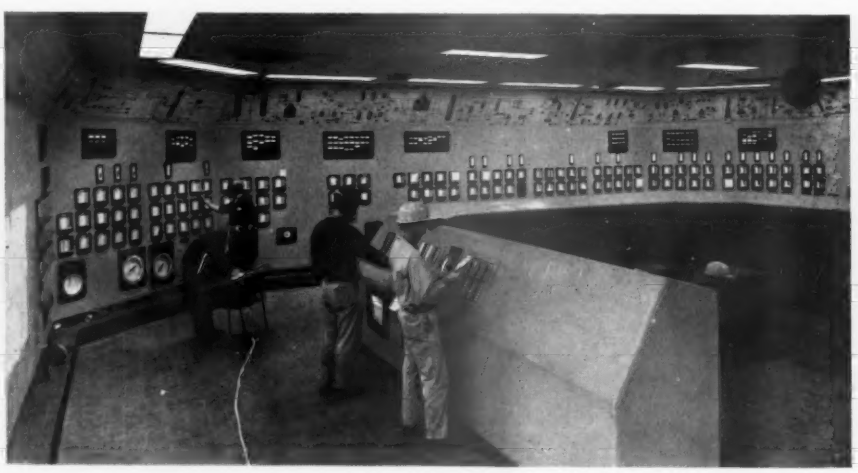
Steam for process requirements only is supplied by two oil- or gas-fired Foster Wheeler natural circulation type boilers, each rated for 130,000 lb/hr at 150 psi and 450° F.

Air for instruments and maintenance is provided by two compressors rated at 2,190,000 cu ft/day. One is electrically driven and the other by a steam turbine. Instrument air, which has preference over maintenance air, is filtered and dried.

Electric power is taken from the grid, the refinery substation transformers being fed by two separate and independent 132-kV, 3-phase, 50-cycle overhead lines. Distribution is at 11 kV, 3·3 kV, and 440 V.

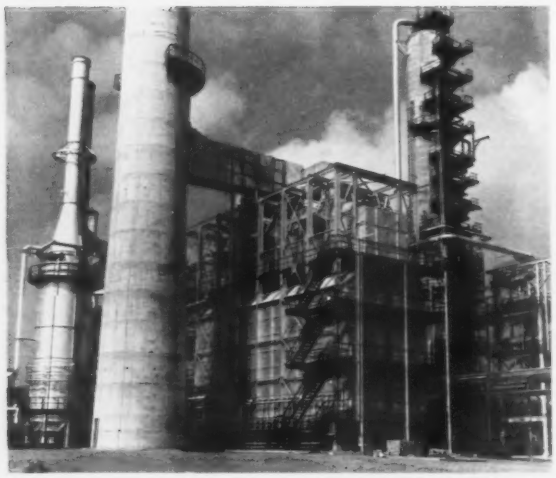
Storage

Incoming crude is stored in



An Esso photo

The control room from which all refinery operations are handled



An Esso photo

One of the world's largest furnaces is that used for the pipestill

An Esso photo

Banks of air coolers in front of the pipestill and Powerformer

nine 150 ft diameter by 54 ft high floating-roof tanks with a total capacity of 1½ million barrels. To ensure uniform feed to the pipestill, these tanks are fitted with two 25-hp mixers.

Intermediate storage consists of 23, and product storage of 27, tanks, these varying in size from 56 ft diameter by 48 ft high to 150 ft diameter and 48 ft high. For LPG there are seven horizontal drums 10 ft diameter by 110 ft long for 10,000 brl of propane, two 52-ft diameter spheres, and two 36-ft diameter spheres for gasoline components.

Pollution Control

Every possible step is taken to reduce to the minimum any air or water pollution. For the elimination of smell from volatile products use is made of floating roof tanks to prevent evaporation. Refinery gases are burned in a multi-jet ground flare with high combustion efficiency, and flue gases are discharged at 300 feet high into the main air stream.

As air is used for cooling, the effluent water is comparatively small, but adequate precautions are taken to avoid any oil pollution of Milford Haven. All process water and some rain water is first processed in an API separator. It is then run, with the remainder of the surface water, into a skimming pond where the last traces of oil are removed. Clean water is discharged into the Haven through a 48-in submerged line.

To control tanker spillage at the marine terminal, an inflatable boom 10 inches in diameter surrounds a tanker while berthed. Any spillage is confined within the boom and is removed by suction into a special barge floating within the boom.

An Esso photo

The refinery and jetty as seen from the air

Marine Terminal

The marine terminal is designed to accommodate two ocean tankers of up to 100,000 dw tons and one 5000 dw ton coastal tanker at any one time. It consists of a 3500-ft approach trestle with a tee-head 2600 ft long in a 9 fathom channel.

Product Distribution

Facilities are available for the distribution of products by road, rail, or sea. Eighteen centrifugal pumps operate on pipelines to the marine terminal and to loading racks for road and rail vehicles. The marine terminal can be gravity fed at lower rates.

For the loading of gasoline and gas oil 4-in Emco-Wheaton loading arms are used, four being located on the road vehicle rack and two on the rail car rack. The road car rack also has two 2-in Chiksan arms for LPG.

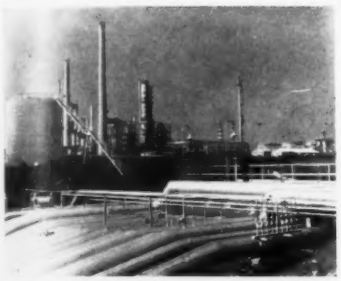
Contractors

Principal contractor for the construction was Foster Wheeler Ltd. Other main contractors were:

George Wimpey & Co. Ltd,
John Mowlem & Co. Ltd,
Whessoe Ltd,
W. Neill & Son (St. Helens) Ltd,
Motherwell Bridge & Engineering Co. Ltd.

Miscellaneous Equipment at Milford Haven

Details which have been received of some of the British plant used in the new Esso refinery at Milford Haven include:



An Esso photo

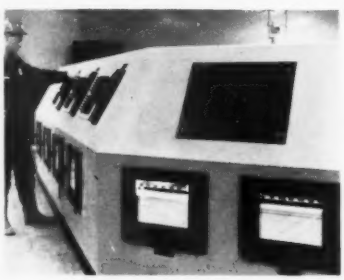
The main pipe band between the marine terminal and the refinery

Bitutherm Weathercoat

For the protection of insulation on all external piping use has been made of over 20 tons of Bitutherm Weathercoat manufactured by British Bitumen Emulsions Ltd. This material is a heavily fibrated bitumen emulsion, the bitumen being supplied by Esso itself. No mineral additive is used and stability to extremes of heat and cold is claimed.

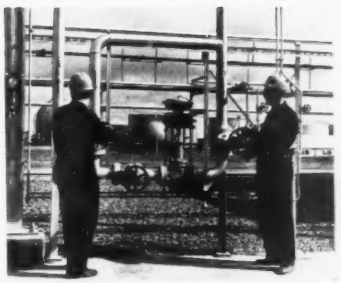
Audco Valves

Audco Engineering Co. Ltd have supplied over one thousand carbon steel valves in sizes from ½ to 24 in to handle crude oil and all products. The Powerformer employs Audco 4-in Class 3000 and 6-in Class 500 standard type and 1-in Class 300 Hypreseal type valves; the copper chloride plant uses 2-in and 6-in standard type valves on naphtha lines and on pump suction and delivery; Class 150 valves of standard type and in various sizes are used in the product loading area; Class 150 valves are installed on the jetty, and on furnace fuel lines.



Electronic Recorders

Electronic strip chart recorders supplied by Honeywell Controls Ltd record such variables as hydrofiner plant and bed temperatures, crude pipestill temperatures, catalyst bed temperatures at various levels, tube metal and process temperatures. Vertical scale precision indicators with switches are also provided to give immediate checks. The Company also supplied moisture and pH recorders and a "quarter-second" recorder used in conjunction with a Perkins-Elmer process vapour fractometer in connexion with vapour-phase chromatography.

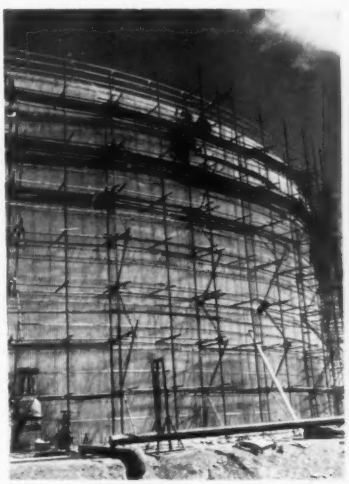


Fisher Controls

The Fisher Governor Co. Ltd, a member of the Elliott Automation Group, supplied a specially designed in-line blending unit, nearly 200 automatic control valves, and many liquid level controllers. The blending unit varies from the standard Fisher unit used on other U.K. and overseas refineries in that the balancing unit is designed to ensure that a product line is never completely shut off.

Tank Insulation

For the insulation of the large crude oil storage tanks use was made of Eldorite mineral wool slabs, manufactured by Cork Insulation & Asbestos Co. Ltd. Exterior finish is corrugated aluminium sheeting and banding with galvanized sheet metal for the roofs and a special metal framing had to be devised to secure these to the tanks. The company also insulated many process vessels, the ducting and pipes in the boiler house, and supplied Eldorite to the contractors for pipe insulation.



An Esso photo

Insulation work nearing completion on a large tank

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INAUGURATION OF KHARG ISLAND TERMINAL

His Imperial Majesty the Shahinshah of Persia inaugurated on 8 November the new crude oil loading terminal, constructed for the Iranian Oil operating companies, on Kharg Island, 25 miles off the Iranian coast of the Persian Gulf, and which was fully described in the *IP Review* February 1960.

Kharg Island loading port is the terminal point of a 100-mile land and submarine pipeline from the Gachsaran field, the latest of the South Iranian oil fields to be intensively developed by the Iranian oil operating companies.

The crude oil from Gachsaran is conveyed to Kharg Island by gravity through the 26–28–30 in pipeline which has a capacity of 390,000 bd. Hitherto crude from Gachsaran was sent down a 12-in 60,000 bd pipeline to Abadan refinery. The new pipeline is the longest gravity-fed line of its size in the world; and the 25-mile submarine section is the world's longest and deepest undersea line of its diameter.

Kharg Island was chosen as the site for the terminal owing to its deep-water berthing facilities which permit loading of tankers of up to 100,000 tons capacity. Existing crude oil loading facilities at Bandar Mashur (where the depth of water is not sufficient for tankers beyond about 45,000 tons capacity) are now working to full capacity and the new pipeline and Kharg Island terminal which took three years to construct, at a cost of approximately £32 million, will substantially increase Iran's facilities for crude oil export.

All loading operations at Kharg are controlled from a central control room with automatic devices which read the tank levels, temperatures, pressures, oil gravities, and basic sediment and water content. The control room operates the valves for loading and regulates the flow of oil from Gachsaran to which it is connected by radio telephone.

Industrial facilities constructed at Kharg Island include a 3000 kW power station, two 150,000 gal/day water distillation plants, telephone exchange, radio telephone link, seven and a half miles of roads, and an air strip.

The new terminal will employ about 200 people for whom houses have been built. A cinema, two clubs, a small bazaar, cold storage, a clinic, and a guest house have been built or are projected; a hospital has been constructed and a school has been opened for employees' children.

Notes of the Month

BP's Ruhr Refinery Commissioned

For the last two years a new refinery has been under construction at Dinslaken, in the German Federal Republic, on behalf of BP Benzin und Petroleum AG, the BP Group's German associate. The first stage of construction was recently completed, and on 20 October last the new refinery was officially opened by the Federal Minister of Economic Affairs, Professor Ludwig Erhard. Other prominent visitors at the opening ceremony included the president of the Federation of German Industries, the president of the Duisberg Chamber of Commerce and Industry, and the Hon M. R. Bridgeman, chairman of The British Petroleum Company Ltd.

Situated about 15 miles north of Duisberg, the refinery obtains its crude oil supplies from a spur of the 245-mile 28-in Wilhelmshaven-Cologne pipeline, owned by Nord-West Oelleitung GmbH (Esso AG 47·2 per cent; BP Benzin 26·3; Ruhrbau Mineralölraffinerie GmbH 8·3—75 per cent owned by Petrofina; Scholvenchemie 7·7; Union Rheinische 6·8; Ruhrchemie 3·7) which commenced supplies to several refineries in the Rhine-Ruhr area in the beginning of 1959. The major processing units involved in the newly-commissioned first stage of the refinery include two 50,000 bd crude distillation units, a 12,500 bd UOP catalytic reformer, a 10,000 bd hydrofiner, a 10,000 bd redistillation unit, a gas recovery plant, and two copper chloride sweetening units for the treatment of aviation turbine fuels, etc.

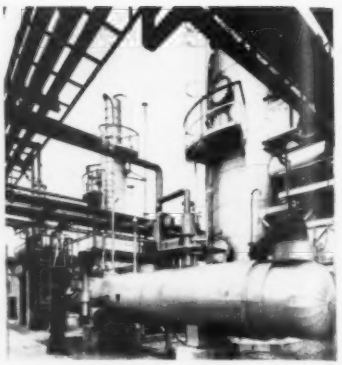
The second stage expansion is due for completion at about the middle of 1961 and will comprise a 10,000 bd catalytic cracking unit and associated vacuum unit, a 100,000 ton/year bitumen plant, and additional copper chloride facilities.

Petroleum chemical feedstocks will be supplied to the new facilities built adjacent to the Bayer plant at Dormagen, near Cologne, operated by Erdolchemie GmbH in which BP has a half-interest. This will also produce other high-grade motor spirit components which will be returned to the refinery for blending. The in-line system for the blending of finished products which is in use at Dinslaken, enables the major quantity of products to be stored in component form, and the blender is run to make particular finished products as and when required.

About half of the refinery's products are distributed by Rhine barges, the rest more or less evenly divided between road and rail distribution. The refinery is linked by six three-mile pipelines to a recently-constructed harbour sited at the junction of the Rhine and the Lippe-Seiten Canal.

A view of the sweetening plant at Dinslaken

The sulphur plant



Engineering design of facilities was accomplished by Kellogg International Corp in conjunction with BP Benzin und Petroleum AG.

First BP Canadian Refinery Opened

British Petroleum's first refinery in Canada was formally opened on 6 October by the Minister of Trade and Commerce for the Province of Quebec, the Hon Andre Rousseau, who unveiled a bronze commemoration plaque.

Sited at Ville d'Anjou, at the eastern end of Montreal Island and about three miles from the St Lawrence River, the refinery has been built to process initially 25,000 bd of crude oil. Construction work began with a ground-breaking ceremony in May 1958, and BP Refinery Canada Ltd was incorporated in October of the same year to own and operate the plant.

At present about 250 acres of the 600-acre site are occupied by the refinery units and tankage, and the area is laid out to permit the installation of new plant if required.

Canada, like the U.S.A., has a high demand for motor fuel, so the refinery is designed to produce a high yield of high octane gasoline. Currently it is producing premier and regular grade motor spirit, burning oil, bunker fuel, diesel fuel, and LPG. Aircraft jet fuel will be added at a later date. In addition, refinery gases are sold to a local works for petrochemical production.

The major processing units of the refinery, in addition to the 25,000 bsd crude distillation unit with atmospheric and vacuum sections, include a 6000 bsd catalytic reformer, a 9000 bsd UOP catalytic cracking unit with associate UOP polymerization facilities of 800 bsd, and a 12,000 bsd desulphurization unit.

Crude and product storage will be contained in tanks of up to 160 ft diameter. Each of these biggest tanks will hold 172,000 brl of crude oil.

Crude oil for processing at the refinery is imported from Trinidad and the Middle East *via* the new 780 ft wharf on the St Lawrence River, built for BP by the Canadian National Harbours Board. Tankers of up to 28,000 dw tons are able to berth alongside the wharf from which a three-mile pipeline route will carry the crude oil to the refinery. The wharf is also available for the export of products which will also be distributed by road, rail, or by means of a connexion with the Trans-Northern pipeline system carrying products from Montreal to Kingston, Ottawa, and other towns to the west of Montreal.

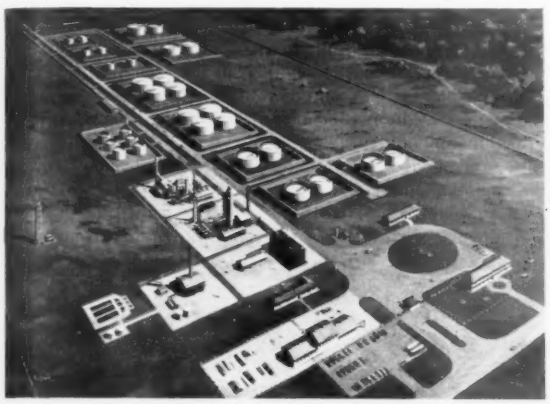
During the winter, when the St Lawrence is frozen, crude supplies can be maintained from the Portland (Maine) to Montreal pipeline, in which BP has a 10 per cent interest.

The refinery is an implementation of BP's marketing foothold in Canada which was begun in February 1957, when BP Canada Ltd was formed to market products in the eastern part of the country. Since then the company has purchased several retail outlets and built or acquired retail service stations in various parts of Quebec Province and by early 1958 had moved into Ontario. The Ville d'Anjou refinery has been built to serve this flourishing marketing region.

Nigeria to Have its Own Refinery

Discussions which The British Petroleum Company has been having with the Federal Nigerian Government on behalf of the Shell-BP Petroleum Development Company of Nigeria, have produced agreement in principle that BP and Shell should jointly build a refinery in Nigeria.

The refinery is likely to be sited in the Port Harcourt area, and will have the capacity to process up to about one million tons of Nigerian crude oil a year. Construction cost is estimated at some £12 million.



An artist's impression of the proposed Nigerian refinery

This will be the first refinery on Nigerian soil to process Nigerian crude oil into refined products for the Nigerian market and it is expected to become operational in 1963 or 1964.

To build the refinery a temporary labour force which may reach 2000 at the peak will be required, and when it is completed the number of employees needed to run it is expected to be about 350. In both phases, the maximum possible use will be made of local recruitment.

A new company, The BP-Shell Petroleum Refining Company of Nigeria Ltd will be incorporated and registered in Nigeria to build and operate the refinery.

First Cargo Arrives at Esso's Tynemouth Terminal

The new Esso Terminal at Tynemouth, Co. Durham, received its first cargo of fuel oil on 27 November, with the arrival of the *Esso Cambridge*, 26,000 dw tons.

The new terminal which cost £1½ million has a capacity of 25,000,000 gallons. It will be the centre from which fuel oils will be delivered by road and rail over a wide area to Berwick in the north, Middlesbrough in the south, and to the Pennines in the west. Bunkers will also be delivered to shipping at ports in the neighbourhood by means of a special 650 dw tons tanker, the *Esso Tynemouth*.

The terminal, which will handle residual fuels, marine diesel, and gas oils, comprises nine tanks. The four largest measure 128 ft by 54 ft, and have a capacity of 5,000,000 gallons. Tank temperatures are measured automatically.

The jetty has two berths, one of which will accommodate coastal tankers of up to 4000 dw tons and the other, ocean tankers of up to 26,000 dw tons. During its construction 500 yards of the Northumberland Dock wall had to be moved.

The principal contractors for the project were Motherwell Bridge & Engineering Co. Ltd, Harbour & General Works Ltd, William Press Ltd, Christiani & Nielson Ltd.

Plans are now well advanced for the expansion of the terminal to enable it to carry motor spirit, kerosine, and farm fuels. This will involve the construction of 23 additional tanks at a further cost of £750,000.

Kuwait in Colour

In the end of October last London's seasonably grey skies and perpetual "monsoon conditions" were made temporarily more bearable by the holding of a photographic exhibition of tropical light and colour graphically portraying the intermingling of eras in the modern Kuwait.

The exhibition of large colour photographs was held by Adolf Morath, the industrial photographer, on the subject of "Kuwait and Its People". The traditional Kuwait of herdsmen and fishermen, although present in some of the photographs, was not stressed so much as the impressions of the new state which has evolved in recent years.

The impression of the state stepping out of the centuries was superbly depicted by the schools, technical colleges, laboratories, and experimental farms and the brightly coloured American cars darting through the streets of Kuwait Town.

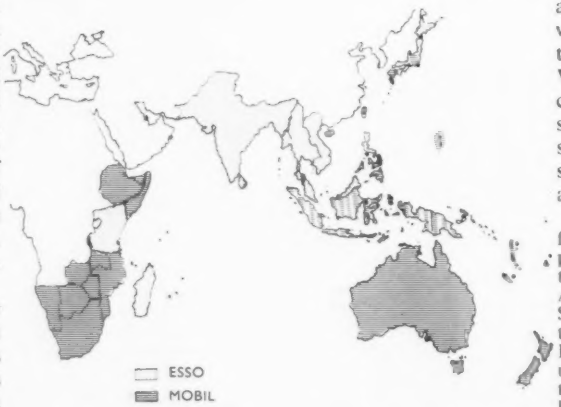
The photographs were all taken with a Swiss Sinar camera using the Agfa negative colour process, and processed at Adolf Morath's own colour laboratories. The result is such that one can only marvel at photography brought to such perfection.

Two black and white reproductions of the colour photographs. The central courtyard and fountain at the state guest-house at Ahmadi . .

. . . and a view of one of the older houses of traditional type in Kuwait town

Standard-Vacuum Joint Ownership Terminated

It was announced in New York on 14 November that the joint ownership of Standard-Vacuum Oil Company by Standard Oil Company (New Jersey) and Socony Mobil Oil Company Inc. is being terminated. The international petroleum interests of Standard-Vacuum will be divided between them, and the portions held by Mobil Petroleum Co. Inc. and Esso Standard Eastern Inc. respectively.



Standard Oil Company (New Jersey) has entered into a consent decree with the United States Government which terminates with regard to Jersey Standard a lawsuit begun against it and four other oil companies in 1953 under the anti-trust laws with respect to operations in foreign countries.

One of the terms of the decree required Jersey Standard to discontinue its joint ownership with Socony Mobil Oil Company of most of the marketing businesses and assets now held by Standard-Vacuum Oil Company. The company said it felt that in addition to being a basis for disposing of the litigation, discontinuance of such joint ownership was desirable from a business standpoint. The consent settlement expressly states that it is no admission of any violation of law. While it prohibits a variety of practices relating to possible agreements with competito.s, these elements of the decree will not affect the company's conduct of its business since they are consistent with its present practices. The company said the decree is a welcome clarification of the anti-trust laws in their application to its foreign operations in so far as they may affect the foreign commerce of the United States. It must be emphasized, however, that Socony Mobil is not party to the consent decree.

Standard-Vacuum Oil Company was formed in 1933 to bring together the complementary activities of Jersey Standard and what was then Socony Vacuum in the Far East. Socony then had widespread marketing facilities in the area, but limited sources of crude oil. Jersey had good crude supplies but no marketing facilities. Establishment of a joint company was seen as a way of providing improved petroleum distribution in the area and in the succeeding years proved a successful means to this end.

However, when Standard-Vacuum's sales outstripped its crude oil production by a wide margin (Stanvac now buys about 70 per cent of its crude from outside sources) there was less justification for it to operate as a separate integrated company. Development in the Middle East of relatively low-cost crude production, which could be easily moved by super tankers to markets east of Suez, made it increasingly difficult for Stanvac's regional organization to compete with the international companies. Furthermore, the separate interests of Mobil and Jersey in other parts of the world called for independent global objectives that were at variance with Stanvac's regional joint-interest objectives.

During 1959 Standard-Vacuum's crude oil production averaged 84,200 bd, (almost entirely from its Sumatra fields) and crude runs at its six refineries were 234,600 bd. Upon completion of the division of Standard-Vacuum, which operates in 50 countries of the world and is spread over an area of 11 million sq. miles, the assets (which total some $855 million) will be held as follows:

Africa: Mobil will acquire the following assets of Stanvac consisting principally of the marketing operations of Standard-Vacuum of South Africa (Pty) Ltd, in the Union of South Africa, South-West Africa, the Central African Federation, Basutoland, Swaziland, and Bechuanaland, Southern Rhodesia, Northern Rhodesia, Nyasaland, Mozambique, Somalia, Ethiopia, Eritrea, French Somaliland. It will also receive Stanvac's exploration interests in Somalia.

Mobil will also receive 100 per cent of Standard-Vacuum Refining Co of South Africa (Pty) Ltd, which owns and operates a 26,000 bd refinery at Wentworth, Durban.

Esso will receive the marketing interests of Standard-Vacuum Oil Co (East Africa) Ltd in Kenya, Tanganyika, Zanzibar, Uganda, Madagascar, Mauritius, Réunion, Comores, and the Seychelles Islands as well as the assets in Société d'Entreposage d'Hydrocarbures and will have the right to a 50 per cent participation in Stanvac's exploration interests in Somalia.

Australia and New Zealand: Mobil will receive 100 per cent of the marketing businesses of Stanvac's affiliates in New Zealand and of Vacuum Oil Company (Pty) Ltd in Australia; 74 per cent of Standard Vacuum-Refining Company (Australia) Pty Ltd, which owns the existing 41,700 bd Altona refinery near Melbourne and the 37,000 bd refinery to be built at Adelaide; half interest in Altona Petrochemical Company (Pty) Ltd which is now building a plant at Altona; and half of Vacuum's 70 per cent interest in Australian Synthetic Rubber Company Ltd. A plant is also being constructed at Altona.

Esso will receive all of Atlantic Union Oil Company (Pty) Ltd, 26 per cent of Standard-Vacuum Refining Company (Australia) Pty Ltd; half interest in a new petrochemical company whose plant is under construction; half of Vacuum's holding in Australia Synthetic Rubber Co Ltd; all of Gilbert & Barker Manufacturing Co (Australia) Pty Ltd; and the right to receive a half interest in any exploration ventures in Australia and Papua in which Vacuum has a part.

Indonesia: Mobil and Esso will each own 50 per cent of the marketing operations of PT Stanvac Indonesia and the exploration, producing, and refining activities of NV Standard-Vacuum Petroleum Mij.

Japan: Esso will receive two-thirds and Mobil one-third of two wholly owned Japanese marketing affiliates and Stanvac's 55 per cent interest in Toa Nenryo Kogyo KK, operating refineries at Wakayama and Shimizu.

Philippines: Mobil will receive all of Stanvac's marketing operations other than those on Luzon which will go to Esso; Esso will receive 69 per cent and Mobil 31 per cent of the stock of Standard-Vacuum Refining Corp (Philippines) (building a refinery at Bataan). Esso will receive all of Stanvac's exploration interests in Luzon while Mobil will receive the right to half of the exploration interests in the Cagayan Valley.

Other: Mobil will receive 100 per cent of Stanvac's marketing businesses on Midway, Guam, Wake, Canton Island, Hong Kong, and Macao and the lubricants and marine bunkering businesses on Taiwan, with Esso owning Stanvac's other business in Taiwan including aviation products.

Esso will receive all Stanvac's interests in South-East Asia

including marketing operations in South Viet Nam, Cambodia, Thailand, Laos, Malaya, Singapore, North Borneo, Brunei, and Sarawak as well as the Stanvac interests in Pakistan, India, Ceylon, Burma, and Goa; Mobil will have the right to receive a half interest in Stanvac's present exploration ventures in India and Pakistan.

In the field of marine operations, Mobil and Esso will hold half interests each in the five marine affiliates of Standard-Vacuum: Standard-Vacuum Transportation Co Ltd, Standard-Vacuum Tankers Ltd, Stanvac NV, Petroleum Shipping Co. Ltd, and Oriental Trade and Transport Co. Ltd, and the four tankers owned by Stanvac will be taken by Esso.

Standard-Vacuum tanker interests total 19 ocean and 13 coastal tankers and in addition, on period charter, 25 ocean and four coastal tankers. The combined owned and period-chartered fleet totals 1,129,400 dw tons.

★ ★ ★

BRITISH COMMON CARRIER AND TERMINAL COMPANY

A private Bill was deposited in Parliament on 26 November by Trunk Pipelines Ltd, seeking powers to construct a pipeline system from Canvey Island to Denham with spurs to Purfleet, Fulham, and Wandsworth, and London Airport.

The Bill provides that the system should be operated as a common carrier and will therefore be available to all users. The charges for the use of the line will be given later in a published tariff.

The system is mainly designed for the transportation of white oils but can be used to carry liquefied petroleum gases and other pumpable substances.

The aim of Trunk Pipelines Ltd is to reduce transportation costs in Britain and make available to concerns which could not economically build separate lines the advantage of pipeline transportation.

The project before Parliament is the first proposal embodying principles which have proven very successful elsewhere. The Le Havre to Paris pipeline can be favourably compared with Trunk Pipelines and has many identical features. Both lines are designed to carry a wide scale of oil products varying from aviation fuel to diesel oil with each company getting individual delivery of its products. The principle of the "common carrier" has never been proposed in the U.K. previously. It is understood that several major oil companies have expressed interest in the scheme.

Oil products from the Shell Haven and Coryton refineries would enter the line in the Canvey area and be piped to distribution depots in centres of consumption. At present petroleum products are moved through the London area *via* barges, road tankers, and some short-distance pipeline stations, allowing little flexibility in operation and incurring high transport costs.

Trunk Pipelines Ltd has carried out its surveys all the way to Birmingham as an extension from West London. The Grand Union Canal has been found suitable as a right of way for the pipeline. The line will be laid mostly on the banks of the canal. Through tunnels it will be hung from the walls and sometimes it may lay in the bottom of the canal. A further prolongation could carry the system to the Mersey and could possibly operate in both directions.

The line from Canvey Island to West London should take 12–18 months to build. A similar period would be required for the section between London and Birmingham. The different sections could be constructed concurrently if required.

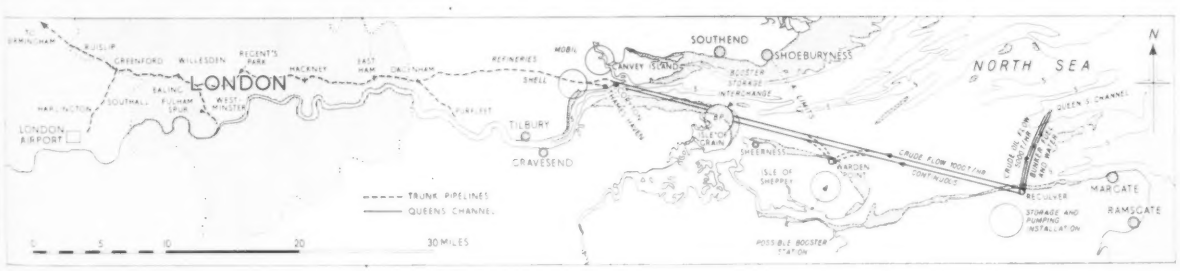
The route from Canvey Island to Denham has necessitated the co-operation of the North Thames Gas Board for the length from Canvey to Beckton, the LCC for that section along the Beckton outfall sewer, and the British Transport Commission for the remainder of the route and the spurs. This route not only takes the line through the centre of London but, throughout its length, avoids, to the maximum degree possible, inconvenience to private land owners.

The fact that the British Transport Commission has granted easements along canals and railroads is also another unusual feature of the line. The revenue from the easements will generate funds for the maintenance of the canal and help to overcome present deficits.

Trunk Pipelines Ltd is a combination of constructional, consulting, and financial interests represented by Collins Submarine Pipelines Ltd, Marine & Remote Centre Oil Installations Ltd, (MARCOIL), and Close Brothers Ltd. Its registered office is 55 Bishopsgate, London, E.C.2 and there have been 18 months of study, survey, and analysis of all the factors involved in such a major project. A figure of £1·5 million has been advanced as the cost of the scheme; however the final estimate cannot be fixed before the final design is completed.

The promoters of Trunk Pipelines Ltd have also incorporated a company called Queen's Channel Terminals Ltd for the construction of a deep-water marine terminal in the Thames Estuary. This terminal is designed to accommodate tankers of any size and is equipped to give a rapid discharge rate of some 8000 tons hr of crude.

The anchorage in the Thames Estuary off Margate would be in a 60 ft depth of water. The crude oil would be carried through large-diameter sea-lines seven miles to a land-based pumping station, and would then be pumped through a pipeline system on the sea bed to the north bank of the Thames Estuary. This would require about 18 to 24 months to construct. The overall scheme can be seen in the map below.



NEW COMBUSTION LABORATORY AT EGHAM

The Shell Combustion Laboratory has recently been transferred to new premises at Egham, where Shell International Petroleum Company Ltd already has its Central Laboratories. The new Combustion Laboratory is designed to carry out investigations into the use of fuel oil, kerosine, and LPG for heating purposes, with a view to raising the efficiency of heat utilization in industrial installations and domestic appliances. To this end it not only seeks to develop improved fuels but it co-operates with manufacturers in improving the design of oil burners, equipment, and plant. It serves the Shell marketing organizations in the U.K., and those operating in other countries which do not have a combustion laboratory.

The Combustion Laboratory began in 1927 at Lensbury Wharf, Fulham, with small facilities for the testing of fuel oil burners. On moving to larger premises in Fulham in 1930 a small laboratory for testing kerosine-burning appliances was also set up, and after steady expansion the two laboratories were amalgamated in 1955 to form the Continuous Combustion Laboratory which was simultaneously integrated with the Central Laboratories. With the growing demands of development and technical service the facilities at Fulham were found to be increasingly inadequate, and as a result a larger, specially-designed laboratory was built at Egham. As with all combustion laboratories of the Group throughout the world, the staff at Egham includes Shell personnel who are nationals of other countries assigned there for periods of initial training, refresher courses, or career development.

The laboratory is composed of three main sections—the Test Block, the Administration Block which includes some smaller laboratories, and the Service Block.

Test Block

This section of the laboratory deals principally with large-scale testing and consists of three main rooms.

For the "Open Day" a variety of demonstrations had been prepared to show some aspects of the work undertaken. One of these showed an investigation of design factors affecting air entrainment and flame characteristics with oil burners for very high temperature applications such as open-hearth steel making furnaces and glass melting tanks. In this demonstration a large test furnace 4 ft square and 15 ft long was used. Furnace temperatures up to about 1450 C can be used and burner testing and examination of combustion conditions can be made at firing rates of up to 50 gal/hr under practical operating conditions. This furnace is connected to the same induced draught or natural draught chimney system as two water-cooled combustion chambers for use with the test burners for low-temperature applications such as boilers.

Tests to assess the performance of a fully-automatic preheating heavy fuel oil burner were shown in the boiler test room, these involving the measurement of a large number of variables. Among the determinations made are the relationship between the Shell smoke number and the air/fuel ratio as assessed by percentage CO_2 in the flue gases, the effect on combustion of atomizing air pressure and fuel temperature (viscosity), and the performance of fuel pump, air compressor, nozzle shut-off valve, and other auxiliaries.

Four permanent test rigs are available for determining the functional characteristics of nozzles. These consist of:

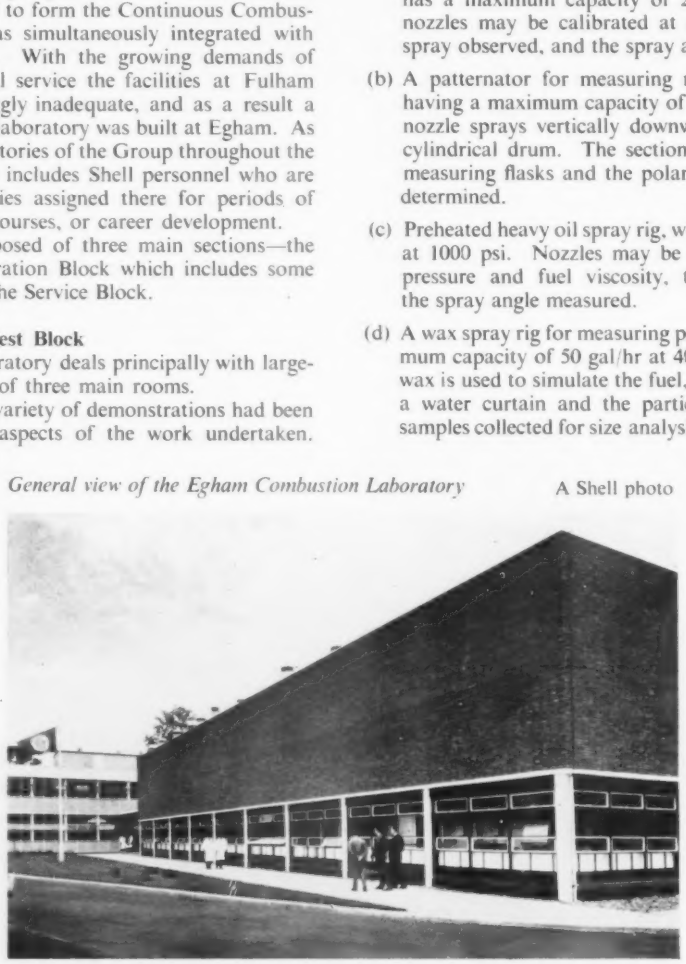
(a) Light oil spray rig for testing nozzles on distillate oils. It has a maximum capacity of 25 gal/hr at 400 psi, and nozzles may be calibrated at any desired pressure, the spray observed, and the spray angle measured.

(b) A patternator for measuring nozzle spray distribution, having a maximum capacity of 20 gal/hr at 200 psi. The nozzle sprays vertically downwards into a sectionalized cylindrical drum. The sections are drained to separate measuring flasks and the polar distribution of the spray determined.

(c) Preheated heavy oil spray rig, with a capacity of 800 gal/hr at 1000 psi. Nozzles may be calibrated at any desired pressure and fuel viscosity, the spray observed, and the spray angle measured.

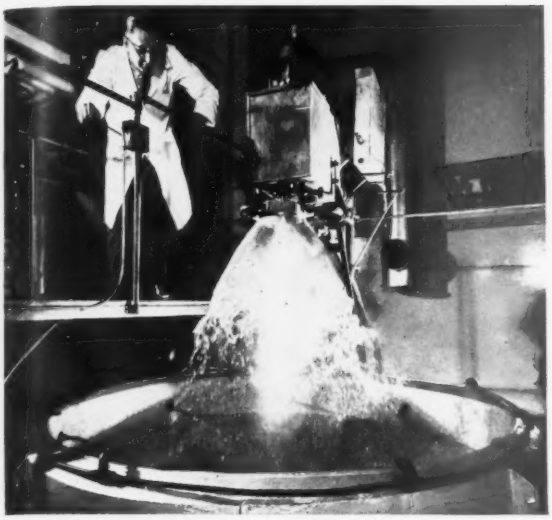
(d) A wax spray rig for measuring particle size, having a maximum capacity of 50 gal/hr at 400 psi. A special blend of wax is used to simulate the fuel, the spray is enveloped by a water curtain and the particles frozen in flight, and samples collected for size analysis by sieving.

General view of the Egham Combustion Laboratory A Shell photo



A further demonstration was the measurement of the temperature of a hot gas by means of a suction pyrometer. A small instrument of this type for use in the field at temperatures up to 1000 C is being developed as an accessory to the Shell smoke meter.

A stack solids rig, originally constructed for work on the solid particles carried in flue gases from an oil burner, has recently been more widely used for flue gas corrosion assessment by many techniques and for many materials. Specimens have to be



A Shell photo

The wax spray rig in the general test shop

immersed in flue gas at constant temperature for lengthy periods and for this purpose liquid-cooled corrosion probes have been developed.

Also included in the test block are several small rooms in which temperature and humidity can be controlled to facilitate special aspects of combustion. Thus to check that a burner or a fuel will be satisfactory at low temperatures a burner and its fuel supply are placed in a cold room and arranged to fire into a boiler situated outside, thereby showing the effect of low ambient temperatures on starting characteristics.

Administration Block

Here are situated on the upper floor the normal office facilities and a drawing office. Below there are five small laboratories for specialized work on small equipment such as kerosine and LPG appliances, pumps and atomizers, and automatic controls.

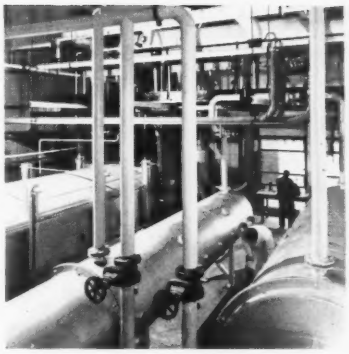
Further rooms are equipped for training and demonstration purposes on the domestic and industrial applications of both liquid and gaseous petroleum fuels. In the liquid fuels demonstration room a selection of burners and appliances is arranged for demonstration and training of personnel on short courses. Selected staff also serve on longer courses in which they carry out tests and experimental work throughout the main laboratory. The parallel work in the LPG demonstration room includes courses for staff to train and advise local agents in correct application and handling.

A survey is being prepared to evaluate in measurable terms the noise generated by domestic oil burning installations. Equipment consists primarily of a Dawe type 1405 objective noise meter, a Standard Telephones and Cables octave filter, and an EMI TR 52/2CH twin-channel magnetic tape recorder. It is thought that it will be possible to measure and record for subsequent replay and analysis the noise of a burner to within ± 2 db of the original sound. The equipment can be installed into an estate car and recordings can be made by a single operator remote from the vehicle.

Other tests demonstrated included those on propane jet tunnel burners producing a very hot, very high-velocity gas stream giving rapid heating by forced convection; the

A general view of the large combustion chamber room

A Shell Photo



Spill - Y - Burner, a small capacity, variable output, medium-pressure air atomizing sprayer of the internal mixing type; and a burner using a propane/air mixture with a very stable, compact flame and a turn-down ratio of well over 100 to 1.

Equipment shown in the kerosine laboratory included Doka plate burners used as cheap cookers in the Sudan, the Delft and Kali cookers for under-developed areas, types of kerosine lamp, and pilot lights for short-drum burners for water heating.

Service Block

Here are accommodated the workshops and various services. The machine and electrician's shops are responsible for ancillary engineering services and maintenance of the whole Central Laboratories.

In the welding shop there was demonstrated work on the development of the oxy-propane burner for such applications as steel cutting, flame cleaning and washing, hardening and stress relieving, non-ferrous metal welding, and billet heating.

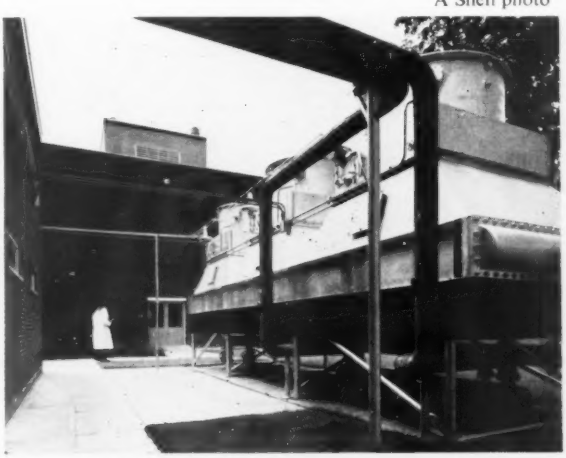
For central heating there are two boilers fired with fully-automatic preheating pressure jet burners using fuel oil of viscosity 200 sec. Redwood I at 100° F.

The services include:—

(1) A plant room, which houses air compressors and fans.
(2) A tank room for test fuels containing six 1000 gal and three 275 gal storage tanks; the large capacity tanks are equipped with fuel pumps to supply fuel to the delivery points while the smalller tanks use gravity feed.
(3) A closed water circulating system to which any water-cooled test apparatus can be connected. The water in this is pumped through an air-cooled heat exchanger which disposes of up to 6 million Btu/hr.

The air-cooled heat exchanger which provides cooling water for test equipment

A Shell photo



TOTAL ENTERS THE U.K. MARKET

Total road tankers at Holehaven terminal

With the announcement on 15 November that Total Oil Products (GB) Ltd—the British subsidiary of Compagnie Française des Pétroles—is to enter the retail motor fuels market in the U.K. a major international company enters this sector of petroleum retail distribution for the first time since Mobil Oil Company (then Vacuum Oil Co.) began motor spirit sales in January 1952.

For the past five years Total Oil Products (GB) Ltd has been engaged in wholesale marketing, and these activities now cover kerosine (burning oil), derv fuel, and gas/diesel oils. Now the company will retail motor spirit, derv fuel, and motor lubricants under its brand-name "Total". All three grades of motor spirit will be sold—the premium and "super-premium" grades having octane numbers of 97 and 101 respectively.

In his speech announcing the decision the general manager of the company, C. G. C. Redman, said "This market might appear, to some of you, to be already well served by existing petroleum distributors. If, however, you travel the length and the breadth of Great Britain with an observant eye—as we have done; if you observe the programme of road improvements and the ever-growing motoring consciousness of the man-in-the-street—as we have done; if you talk with the leaders of the motoring industry—as we have also done; and if you study the cold statistical facts relating to the growth of the motor industry and the ever increasing number of cars on the roads, you will be convinced that there is a place for a newcomer who, without upsetting the present framework of the market will, nevertheless introduce new vitality and fresh ideas".

The first Total garage was opened at Bushey Heath, Hertfordshire, on 1 December, and a further two to the south of London began operations a few days later, whilst three stations were opened in the Manchester area in the same month. Within six months the company hopes to be retailing through 150 garages. The reason behind this claim is that according to the company maybe 20 per cent of present agreements between garage owners and marketing companies are due to expire before the end of 1961. It has been emphasized that Total have no wish to indulge in any price war with the present petroleum marketers. At present all of the company's product supplies will be imported, and for the time being facilities at the Holehaven terminal of London and Coastal Oil Wharves Ltd near Canvey, Essex, will be used for storage purposes.

The company has under construction at Swedish Wharf, Fulham, a new depot which will come into operation in the new year. Its total product capacity, which includes all grades of motor spirit, derv fuel, gas oil, and kerosine, amounts to 615,000 gallons. It is also intended to handle lubricating oils.

The site has a frontage to the River Thames and the products will be off-loaded from barges bringing the products from the Company's storage at Holehaven. The underground tankage of 350,000 gallons is now being constructed to meet the requirements of the London County Council. The tanks are essentially rectangular construction strengthened to meet the requirements of hydraulic design and are encased in a complete concrete surrounding structure with bulkhead walls between the different classes of products to prevent any possibility of contamination.

The above ground storage will consist of vertical circular tanks and horizontal cylindrical tanks with a total capacity of 261,500 gallons.

Underground tankage is being built by Whessoe Ltd, and the main contractors are Wm. Press & Sons.

The depot will be supplied by barges which are discharged by rotary positive displacement pumps manufactured by Stothert & Pitt Ltd. The roadcar loading pumps are the vertical spindle submerged type manufactured by Pulsometer Engineering Company Ltd.

The roadcar loading equipment is designed for bottom and top loading with positive displacement type meters fitted with ticket printing.

The pumps for filling roadcars will be push button switch-operated from the loading points, and the pipe system will be equipped with all the most up-to-date apparatus. There will be a new office, a garage with workshop, and washdown bays for cleaning the roadcars.

This depot has been designed, and the construction is being supervised, by consulting engineers Pencol Pipeline & Engineering Consultants.

A second depot is being planned for installation at Ellesmere Port to serve the Liverpool-Manchester areas. Pencol will also be the consulting engineers in this project.

Total Oil Products (GB) Ltd is one of the approximately 70 subsidiaries and affiliates of the Compagnie Française des Pétroles Group. The French Government owns 35 per cent of the share capital with voting rights of 40 per cent. The remainder of the ownership of CFP is as follows:

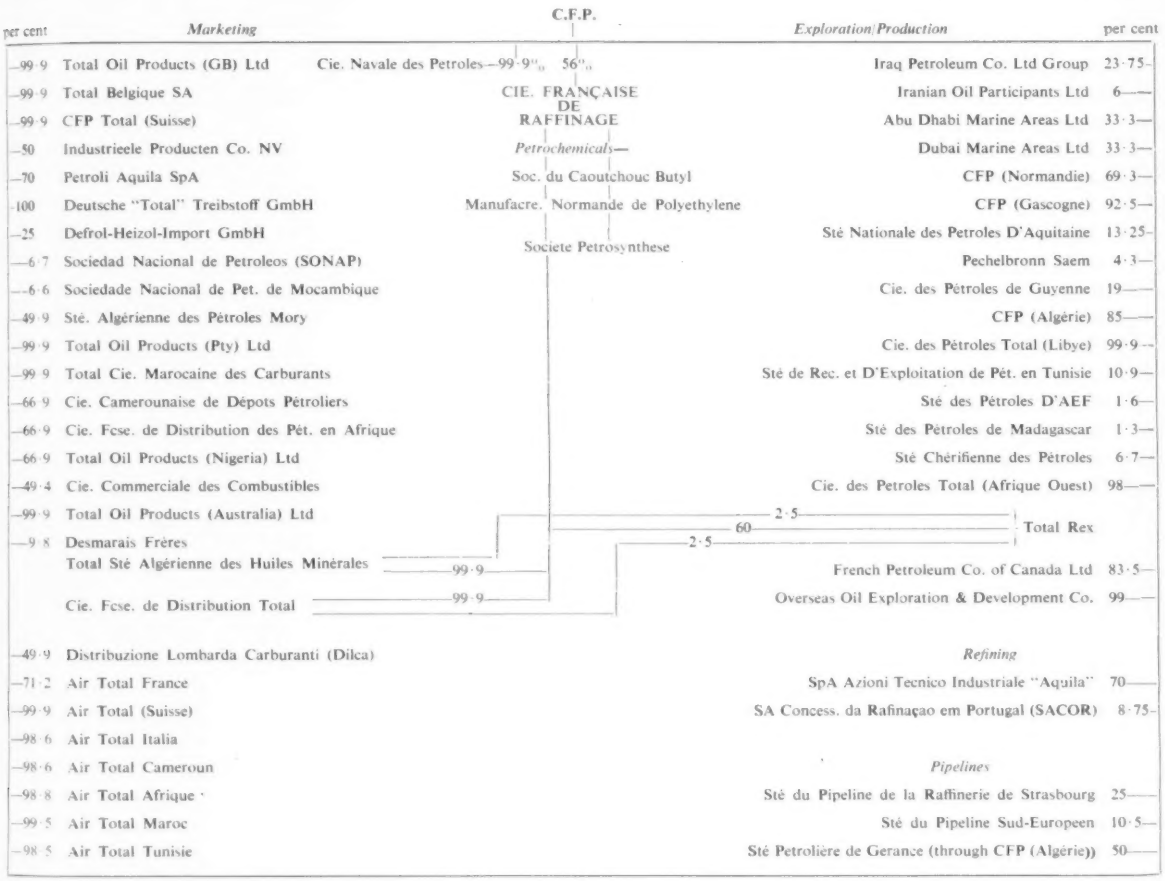
	per cent
Desmarais Frères	1·74
Banque de Paris et des Pays-Bas	1·5
Sté Française des Pétroles BP	1·1
Banque de l'Union Parisienne	1·21
Cie Auxiliare de Navigation	1·14
Omnium Française de Pétroles	1·14
Crédit Lyonnais	0·83
Cie Française des Automobiles de Place	0·5
Sté Nationale d'Investissement	0·44

	per cent
Sté Lille-Bonnières et Colombes	0·58
Caisse des Depots et Consignations	0·44
Various banks and investment houses	1·7
Other various private investors	48·52

CFP was incorporated in 1924 to develop the French holding in what was then the Turkish Petroleum Company—now the Iraq Petroleum Company. Present Group production is at a level of about 14 million tons a year, and the new era of oil search and production in the French Sahara has added a new dimension to CFP's operations. The joint efforts of CFP (Algeria) and SNREPAL since 1952 resulted in the discoveries in 1956 of the Hassi Messaoud oilfield and the gas field of Hassi R'Mel. Earlier last year the large-diameter pipeline outlet from the Hassi Messaoud field—400 miles of 24-in pipe—was completed to the Mediterranean port of Bougie.

There are two French refineries of the CFP subsidiary Compagnie Française de Raffinage. The Normandy plant at Gonfreville—l'Orcher, near Le Havre recently had an increase in throughput capacity to bring it to 6,600,000 tons year. Its catalytic cracking unit, with an annual capacity of 1,500,000 tons, is one of the largest in Europe. The Provence refinery at La Mède, near Marseilles, has a throughput capacity of 5,900,000 tons/year, and catalytic reforming facilities totalling 800,000 tons are some of the largest in the world.

Other Group refineries, or refineries in which CFP has a participatory interest, are at Aquila, Trieste; Abadan; the ANTAR refinery at Donges; and the SACOR plant at Lisbon. Two further refineries are planned: one at Strasbourg with an initial capacity of at least 3 million tons/year, and an Algerian refinery with a 2 million tons initial annual capacity. Completion dates are early 1963 and 1961 respectively.


C.F.P.
per cent
Marketing
Exploration/Production
per cent
99·9 Total Oil Products (GB) Ltd
Cie. Navale des Petroles—99·9% 56%
Iraq Petroleum Co. Ltd Group 23·75
99·9 Total Belgique SA
CIE. FRANÇAISE DE RAFFINAGE
Iranian Oil Participants Ltd 6
99·9 CFP Total (Suisse)
Abu Dhabi Marine Areas Ltd 33·3
50 Industrieele Producten Co. NV
Petrochemicals—
Dubai Marine Areas Ltd 33·3
70 Petroli Aquila SpA
Soc. du Caoutchouc Butyl
CFP (Normandie) 69·3
100 Deutsche "Total" Treibstoff GmbH
Manufacre. Normande de Polyethylene
CFP (Gascogne) 92·5
25 Defrol-Heizol-Import GmbH
Societe Petrosynthese
Sté Nationale des Petroles D'Aquitaine 13·25
6·7 Sociedad Nacional de Petroleos (SONAP)
Pechelbronn Saem 4·3
6·6 Sociedade Nacional de Pet. de Mocambique
Cie. des Pétroles de Guyenne 19
49·9 Sté. Algérienne des Pétroles Mory
CFP (Algérie) 85
99·9 Total Oil Products (Pty) Ltd
Cie. des Pétroles Total (Libye) 99·9
99·9 Total Cie. Marocaine des Carburants
Sté de Rec. et D'Exploitation de Pét. en Tunisie 10·9
66·9 Cie. Camerounaise de Dépots Pétroliers
Sté des Pétroles D'AEF 1·6
66·9 Cie. Fcse. de Distribution des Pét. en Afrique
Sté des Pétroles de Madagascar 1·3
66·9 Total Oil Products (Nigeria) Ltd
Sté Chérifienne des Pétroles 6·7
49·4 Cie. Commerciale des Combustibles
Cie. des Petroles Total (Afrique Ouest) 98
99·9 Total Oil Products (Australia) Ltd
2·5
60
Total Rex
9·8 Desmarais Frères
2·5
Total Sté Algérienne des Huiles Minérales
99·9
French Petroleum Co. of Canada Ltd 83·5
Cie. Fcse. de Distribution Total
99·9
Overseas Oil Exploration & Development Co. 99
49·9 Distribuzione Lombarda Carburanti (Dilca)
Refining
71·2 Air Total France
SpA Azioni Tecnico Industriale "Aquila" 70
99·9 Air Total (Suisse)
SA Concess. da Rafinaçao em Portugal (SACOR) 8·75
98·6 Air Total Italia
98·6 Air Total Cameroun
Pipelines
98·8 Air Total Afrique
Sté du Pipeline de la Raffinerie de Strasbourg 25
99·5 Air Total Maroc
Sté du Pipeline Sud-Europeen 10·5
98·5 Air Total Tunisie
Sté Petrolière de Gerance (through CFP (Algérie)) 50

NEW CATALYTIC REFORMER FOR KENT REFINERY

A catalytic reformer, for the conversion of low-octane naphtha and benzine into high-octane components for blending premium grade motor spirit is to be built at BP's Kent refinery. It will have a capacity of 23,000 bd. Site preparation has already started, and engineering work is under way. The new unit is expected to be completed in early 1962.

There are already two catalytic reformers at Kent refinery. The first, which was commissioned in 1955, has a capacity of 6000 bd, and the second, which began operation in 1958, can process 10,000 bd.

NLOGF Annual Dinner

N. K. WORTERS · President

The Annual Dinner of the National Lubricating Oil and Grease Federation, at Grosvenor House, London, on 2 November last was again a happy and successful occasion, and again there was a record attendance. There was a distinguished company of guests and members, under the presidency of N. K. Worters, J.P.

The principal guest was J. C. George, C.B.E., M.P., Parliamentary Secretary to the Ministry of Power.

The Toasts

The loyal toast having been honoured, **The Parliamentary Secretary to the Ministry of Power** proposed the toast of the Federation, with which he coupled the name of the president.

He held it a very high honour, he said, to be the Federation's guest, and a privilege to propose the toast. When he was invited to be the Federation's guest it was said that as the representative of the Ministry which controlled the destiny of the industry he would be welcomed by the members. He was very relieved to see that the Ministry did not control their destiny. But it would be wrong of him if he did not say how grateful the Ministry was for the assistance the Federation had given it; the arrangements made between the Federation and the Ministry for the benefit of the nation reacted to the benefit of all.

It was said that the Ministry's policy was based on competition among the various suppliers of fuel. It saw absolutely no reason at this stage to alter that policy; it believed that competition increased efficiency, that freedom of choice dictated the size of every industry; that fuel policy was so simple that people did not realize it was a policy at all. He was sure that, to the members of the Federation, it meant free enterprise.

J.C. GEORGE, C.B.E., M.P. MINISTRY OF FUEL

The lubricating oil industry had never been the centre of acrimony and, so far as he knew, nobody seemed to have asked for it to be nationalized. Before the war Britain had imported 80 per cent of its lubricating oil requirements from the United States, and now, thanks to the efforts of the home industry, substantial quantities were being exported overseas.

There was never a time when exports were of such crucial importance to Britain as now. If the members of the Federation could find ways of expanding their existing export markets or developing new ones, next year at this function they would be as proud as their grateful and willing guests.

The industry had proved itself efficient; but he could remember a time when it was not so efficient. He was then a young boy working in the pits, and his job was to push loaded trams up what had appeared to be a terrible gradient. The grease that was used on those trams was usually either too thin or too thick, it was seldom right. But since then the lubricating oil industry had learned something far more quickly than was the case in the coal mining industry, which was learning it to-day; it was to educate customers to use the products properly. How different would the situation have been if the coal trade had learned the lesson earlier. Customer education was the way to higher sales and satisfied customers.

Concluding his remarks, Mr George acknowledged the great debt which industry generally owed to the research, hard work, and salesmanship of the oil industry. They had tackled extremes of temperature, challenging them and defeating them. The future would hold challenges equally as great, and they would defeat those challenges as they had done in the past. The pattern of their activities was one of high achievement, and he wished the Federation and all its members shining success in the future.

The President of the Federation, responding to the toast, said it was a very great privilege to do so, and thanked Mr George for having come along to the Dinner, at great personal inconvenience.

Following the example of his predecessor, the President refrained from giving an account of the Federation's activities, that would be duly rendered at the Annual General Meeting on the following day. But for the benefit of those who would not be able to attend that meeting he said it was in good heart, its elected Council was assiduous for the common good, and its members were active—they had to be if they wished to remain in business. As for conditions in the industry, it was not for him to make a pronouncement or to prophesy. Were he to say—and the members to agree—that trade was good, the refiners and wholesalers, to whom the members owed so much, might be tempted to put up

their prices again. On the other hand, looking around the assembly, he would not dare say that trade was bad; the prosperity of the members was evident. He had therefore decided to abandon any attempt to forecast the future, but to dwell, instead, on the glories of the past.

It was in this month 41 years ago that the four lubricating oil associations in Bristol, Liverpool, Manchester, and Newcastle, had resolved, at a meeting in Manchester, to form a national federation. There were no associations at that time in London or Yorkshire. The centenarians of this year, Alfred Hopps & Sons and Arthur Brown & Company, were a mere 59 years old; Ken Pratt had yet to sell his first barrel of oil, John Burningham was still in his pram. All lubricating oil came into Britain (almost all from the United States) in barrels. A barrel was a barrel remarked Mr Worters—red for Anglo-American, blue for the Gulf Refining Company—and it was given away with the oil. "None of your 50-shilling drums!"

The speaker commented that Vacuum oil was especially beloved by marine engineers (they had called it "vaccum" and still did so). Castrol's best advertisement was its smell. There was no Shell oil on the consumer market, Esso as a retail brand had not been born. What a paradise for salesmen! In those days and until a much later date oils were not disguised under numbers, but had distinguished names like Queens Heavy Red, Invincible Pale, Bayonne, Victory Red, Cosmos. There was even an oil named after Manchester—"Manchester Spindle".

The Federation was brought into being on 1 October 1921, with Bruce Dick as its first president; but in a few years the scarcity, which was one of the reasons for its formation, had turned to plenty. In 1927 the Federation's executive passed a resolution pointing out to all members "the vital importance of reducing the evils of price cutting, contributed to by both large and small firms". Truly there was nothing new under the sun! Turning the pages of history further, the president recalled that in 1931 there was an economic crisis—they did not come so often in those days but were certainly more serious—there was no dinner that year and subscriptions were reduced by 50 per cent. The Federation should bear that precedent in mind!

In 1935 the then secretary of the Federation, Mr Pigott, had produced a plan to solve the evils of competition. The president quoted from it: "This will put hundreds of thousands of pounds into the pockets of both distributors and importers and not only that but will do away with all cutting of prices by distributors." In 1937 a Sports Committee was founded. One supposed its object might have been to provide an outlet for members' energies as a result of the accumulated wealth produced by Mr Pigott's scheme. It was not surprising to note that T. W. Ransom was a member of that committee, but records did not relate his activities. Two years later the war came, and it was the existence of the Federation that had enabled the smaller companies to remain in being.

If there were any who would ask what the Federation had done, he could only suggest that they should look at the records, in the Federation's office at Audrey House, Houndsditch, and they would be astonished by the work for the good of the trade that had been tackled with enthusiasm over the last 40 years.

At the top table were the survivors, those still in business, of the past-presidents who had taken the burden of responsibility through times of great difficulty, and the doyen of them was Mr Eberle, president in the year 1925-26. Those past-presidents were distinguished by replicas of the president's badge of office which they wore, and on behalf of them all he thanked the directors of Goodall, Bates & Todd —Mr Thwaites and Hugh Bates—for implementing the very generous offer they had made a year ago, when the handsome presidential badge was presented to the Federation, to give replicas to all those still in business to date, in memory of the late James Todd—the GOM of the Federation—and of the late Herbert Bates, who had stood behind him in all his endeavours.

Members were fortunate, continued the president, to be part of the oil industry. The consumption of lubricating oil was increasing; it had nearly doubled in the last 20 years. There was room for all who were in the trade, in spite of the narrowing field caused by groupings of industry. He suggested that the greatest need was to maintain a policy of orderly marketing and restraint; "if there is a rat race, do not join it". That suggestion applied to small firms as well as large. But the refiners, who had a considerable interest in maintaining the independent blenders, had a special responsibility, that of restraining their consumer sales departments from being too lavish with their great resources, concessions, etc., and of ensuring that lubricating oils were sold at their economic value.

There was and always would be a place for the smaller independent firms provided they maintained their technical efficiency and continued to give that specialized, and in many cases localized, personal service for which they were unrivalled.

E. Attwood (vice-president), proposing the health of the guests, said the most pleasant duty which fell to him during his year of office was to welcome them to this dinner.

The Federation's Principal Guest, Mr George, had already been warmly welcomed by the President. It was left to Mr Attwood to deal with a question which might be in some people's minds, as to what the members had most in common with the Ministry of Power. Perhaps the most important common bond was that both endeavoured to keep things moving with as little friction as possible—with the difference, perhaps, that the members of the Federation made things slide!

He also extended on behalf of all members a hearty welcome to Mr Rocke in his role as president of the Oil Industries Club. Many of them were members of the Club of which he had been president three times, in 1957, 1958, and 1960. He also represented a major petroleum company which in the United Kingdom was launched from the loins of a lubricating oil company.

The members of the Federation were always pleased to welcome representatives of large petroleum companies to the Annual Dinner, even if it were rather like offering the elephant a *Smartie!* They liked to think that their elephants were kindly disposed to smaller beings and enjoyed being present. Some of the companies represented had moved, or were about to move, into splendid new offices, and it was therefore most important that he should remember that people who lived in glass houses must not throw stones.

He was also very happy to see present, as usual, the Federation's staunch supporters, the wholesalers represented by Norman Melluish. The hosts were pleased that the wholesalers, as a body, were prospering.

He offered a special welcome to Mr Eberle and looked forward to his being present at many more annual Dinners. All were sorry that Dr Redgrove, who was president 27 years ago, was unable to be present owing to indisposition, which they hoped would be only temporary.

H. W. Rocke said that Mr Attwood had welcomed him as the president of the Oil Industries Club. The Federation had one thing in common with the Club, that they were both centres of good fellowship. They worked in a highly competitive industry, but there was no industry in which there was greater fellowship.

It was a privilege, he concluded, to express on behalf of the many guests who were present their great appreciation of the hospitality bestowed upon them, and, above all, they welcomed the opportunity to share in the very good fellowship which prevailed on that occasion.

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Personal Notes

D. L. Samuel, F.Inst.Pet., the Institute's honorary associate editor since 1954, retired from the Shell International Petroleum Co. Ltd at the end of December after 34 years with that Company in various capacities. At the time of his retirement he was a technical adviser. Mr Samuel has taken up a position with the Pergamon Press Ltd and is to continue his activities in the Institute.

The Iraq Petroleum Company has announced that consequent upon the retirement of **C. T. Barber,** D.Sc., D.Phil., F.G.S., F.Inst.Pet., at the end of 1960, **J. C. B. Edwardes** is appointed Head of Public Relations Department. Dr Barber, who had held the position since July 1949, is recognized as a geologist of distinction. A graduate of the Universities of Birmingham (D.Sc.) and Basel (Dr Phil.), he was from 1923 to 1935 with the Geological Survey of India and was seconded to the Government of Burma as resident Government geologist.

Dr C. T. Barber

In 1935–40 he was engaged on the search for oil in Great Britain as geologist with the D'Arcy Exploration Company. Early in 1940 he joined the Ministry of Fuel and Power, specializing in oil technology and economics, and for two years was head of the New York office of the British Petroleum Mission in the United States. In 1946, Dr Barber became joint editor of the *Petroleum Times* and author of its *Review of Middle East Oil* until he joined IPC.

With his quietly authoritative manner and sympathetic approach, Dr Barber will be greatly missed by all at IPC. But he is a man of many hobbies which he will now be able to enjoy to the full. He is a brilliant amateur photographer, a keen gardener, and a lover of the English countryside. We wish Dr Barber and his wife many happy years of retirement at their home in Purley, Surrey.

Julius Edwardes, who takes over from Dr Barber, has been deputy head of Public Relations since 1951. Before joining the IPC Group of Companies, he had been for nearly four years head of Information Department, AIOC in south Persia. Son of a geologist, he was born in the oilfields of Baku in 1917. He is a versatile linguist who speaks several oriental and Slavonic languages.

D. G. L. Bean, M.C., M.Inst.Pet., has been appointed general manager, Supply and Development Department of The British Petroleum Company.

He joined BP in 1936 in the Petroleum Supply Branch of Distribution Department, and after the war he rejoined Petroleum Supply Division becoming assistant general manager of that Division in 1952. Two years later, when the Division was merged with Central Planning Department to form what is now the Supply and Development Department, he was appointed manager, Supply Operations Group and later, in 1955, assistant general manager. In 1956 Mr Bean was transferred to BP Tanker Company to become deputy general manager and two years later he was appointed to his present position of general manager, BP Tanker Company.

D. G. L. Bean

P. A. Medcraft, A.I.Mar.E., has been appointed general manager of the BP Tanker Company Ltd in succession to D. G. L. Bean.

Mr Medcraft joined the Company in 1946 as a distribution trainee. In 1948 he was posted to China to take charge of the Company office in Shanghai, and on returning to the U.K. in 1949 joined Trade Division as branch manager, Western Hemisphere. He was transferred to the BP Tanker Company in 1953, becoming an assistant manager in 1956 and assistant general manager, Technical Co-ordination, in 1958.

P. A. Medcraft

THE OIL INDUSTRIES CLUB DINNER

The Oil Industries Club entertained many distinguished guests and members at its Twenty-Fourth Annual Dinner, in the Great Room at Grosvenor House, on 18 November. H. W. Rocke, the president, was in the Chair, and the principal guests were Wilson T. M. Beale, Minister for Economic Affairs, American Embassy, and Julian M. Leonard, President of the Institute of Petroleum.

Mr Beale, on rising to propose the toast of "The Oil Industries Club", said that at various times since the war he had had occasion to familiarize himself with the problems of the oil industry. In his line of business they were called in only when there were problems. As a result of these somewhat episodic contacts with the oil industry he had been impressed by one important feature, that each time he had returned to the subject the situation had been completely different. No sooner did he become accustomed to the idea of worrying about a surplus of oil than he was told, no, that was not our problem; what we were concerned about now was a shortage. He gathered that the industry was now back on familiar ground and was worrying about a world surplus.

Nevertheless, what other industry could point to an average annual increase of over 7 per cent in world consumption during the past decade? And the experts, he understood, forecast an increase of 6 to 7 per cent over the next several years.

The speaker pointed out the technical advances the industry had made in refining and drilling techniques, in secondary recovery, and in product improvement; the vast growth of the petrochemical industry; the increased demands for the products of the industry—more automobiles all the time, dieselization of railways, more use of labour-saving machinery that required oil. And finally, a decade was just beginning which was bound to see a tremendous development in economically backward countries.

He congratulated the industry on the contribution it had made to the progress of the less developed countries. We heard a great deal about the importance of private investment in helping those countries. Petroleum investments last year accounted for more than one-third of the value of all U.S. direct investments abroad. The figure was sizable—$10,500 million. The British oil industry had also added substantially to private investment in the less developed countries. He thought both the U.K. and the U.S.A. could take pride in the vitality of private enterprise in these fields.

One had no doubt in which direction the oil industry was going. He did not agree with those who regarded the present situation as indicative of a permanent malaise. He thought they were wrong when they assumed that the industry's transient difficulties forecast a fundamental change in direction.

He was convinced that the oil industry would face its difficulties successfully in the future, as it had in the past. The industry had grown enormously and it promised to continue to expand at a high rate in the foreseeable future. He felt confident, therefore, that the high level of ability and experience which characterized the management of the petroleum industry, its impressive rate of technical advancement, and the vital role it filled in the field of fuel and energy, would assure its continued progress and prosperity.

The President, in responding to the toast, said the assembled company were most grateful to Mr Beale for honouring them by his presence, and thanked him warmly for the very gracious way in which he had proposed it.

Speaking of the Club, he said it had been in existence for some 35 years, and it was a matter for great pride that there were two very active original members present. He referred to Sir Reginald Ayres, a past president, and Ernest Thorn, the vice-president, who had been hon treasurer since the Club was formed.

Coming towards the end of his term of office, the president took the opportunity to express his very sincere thanks to the various committees—and to Fred Coe, the secretary—for their very willing support. He made special mention of the members of the Reception Committee, who made all the arrangements for the Annual Dinner, and thanked them on behalf of all present.

The President then proposed the toast of "The Guests". It was a very great privilege, he said, on behalf of the members, to extend a very hearty welcome to them all.

After mentioning certain of the guests by name, the chairman welcomed the guest who had kindly consented to respond to the toast, Julian M. Leonard, and said it was a very real pleasure to do so on behalf of the members and to wish him a very successful period of office. They were all very appreciative of the quite magnificent work which the Institute did for the industry.

It was remarked that Mr Leonard was deputy chairman and managing director of Carless, Capel & Leonard Ltd, and that it was a great honour to have as a guest one who was so closely associated with the oldest oil company, whose early partners were the pioneers of the petroleum industry in England.

Julian M. Leonard, in his response thanked the hosts, and their president, on behalf of the guests, for inviting them to be present and for showering upon them such bounteous hospitality.

He confessed that this was the first time he had ever attended one of the Club's gatherings. The atmosphere of friendliness and of good fellowship struck one very forcibly, and this perhaps was not to be wondered at. Surely the very reason for the Club's foundation 35 years ago was to provide in London opportunities for social intercourse amongst Canadian drillers and oil men generally who came and went from and to all parts of the world. It seemed to have continued to do so very successfully ever since.

He had been intrigued, he said, by the way of the Club's foundation and how it was that asparagus was the foundation stone. He recalled the notice: "British Luncheon Club, New York, 1923. N. L. Mackenzie. Oil Well Engineering Company. Asparagus Dinner, 23 May". Except it be appropriate to the time of year or of sentimental significance, he said, he could find little connexion between asparagus and the drilling for oil. He would hardly have thought that an asparagus-tipped drill would have been man enough to penetrate far into the earth's crust; but perhaps it was the warm heartedness of the Club's founder and his delight in entertaining people with unusual delicacies that had put that succulent vegetable to a practical purpose. Nowadays everyone must have an emblem or a sign, and he commended to the Committee that the Club might well adopt the sign of an asparagus tip—and British at that—as its coat-of-arms. If they wanted to know how to cultivate asparagus worthy of such eminence he might be able to give them a few tips, for he had been growing it for many years; and one thing he did know was that we had to put some salt on its tail.

BRITISH-MADE OILFIELD EQUIPMENT

Operations in the Woodfield Group of Companies

Although it is only some fifteen years since Woodfield Rochester Ltd first became interested in the manufacture of well drilling and production equipment, the Company now has a high reputation in this field. About a year ago, the Company secured the award of a large contract, valued at over £750,000, for the supply of drilling rigs and equipment to Yugoslavia. That contract has been completed, and covered two drilling rigs for depths of up to 9000 ft complete with cementing equipment and all tools and ancillaries. Plant for secondary recovery systems for the older Yugoslavian fields was also included and incorporated unitized pump systems for water-flooding and a number of gas compressors. Some of the material was purchased from overseas and other British suppliers were associated with Woodfield as sub-contractors.

Drilling and production equipment is also being supplied to many oilfields, particularly in the Middle and Far East, the British West Indies, and South America.

Prior to 1945, when the Company was known as Woodfield Hoist and Associated Industries Ltd, it had for a long time been engaged in the design and manufacture of various types of hoisting gear. It was then already well-known in the field of civil engineering, particularly for its piling machinery, cranes, and winches.

In 1945, the Company turned its attention to oilfield requirements and has developed a wide range of mobile production and drilling machinery and ancillary equipment. In this sphere, Woodfield Rochester has made a considerable contribution to the availability of British-built oilfield equipment. In addition to the manufacture of plant to its own designs, the Company also fabricates under licence plant designed by other companies. Thus, in 1952 Woodfield obtained a licence from IDECO of Dallas, Texas, through Dresser AG, an affiliate of Dresser Industries Inc of the U.S.A., for the manufacture and sale of plant to their design. At present time IDECO-designed rigs for drilling to depths of more than 12,000 ft are being built at Rochester.

Recently the *IP Review* had an opportunity of visiting the Company's main works at Rochester and observing work in hand, not only by Woodfield Rochester but also by some of its subsidiaries. More will be said about the other companies in the Woodfield Group later.

The works are located on the north bank of the Medway, at Rochester, and at present occupy an area of about ten acres. An area of a similar size is available for expansion in due course. Some of the occupied space is used by other members of the Woodfield Group and a total of nearly 500 staff are employed.

An interesting variety of work was passing through the shops, which are well equipped for their purpose.

The Company is particularly interested in the construction of portable and semi-portable rigs, in several designs of which the truck engine serves for both propulsion and rig operation. Three types of such rigs are available, the largest being capable of drilling to depths up to 7500 ft with $2\frac{7}{8}$-in drill-pipe.

A useful servicing hoist produced by the Company is the "Fieldmaster", mainly used for swabbing, bailing, or tube pulling to depths of about 4000 ft. This hoist can also be used for rotary drilling to 2000 ft with $3\frac{1}{2}$-in drillpipe, or 3000 ft with $2\frac{7}{8}$-in drillpipe.

Other types of drilling rigs manufactured include the Rambler type which, as the name implies, are fast and readily transportable even over difficult ground.

Two special types of drilling mast are made at Rochester. The first is the Kwik-Lift mast, which is made in seven sizes. All are designed for well to well transport with all lines in place and equipment intact, thus ensuring rapid rigging-up. The second type is the "Full-View" version in which the driller always has the derrick man and travelling block in full view. An interesting feature of this mast is that the raising legs act as load bearers to provide stability when the mast is erected.

A Junior Full-View mast for Yugoslavia on the test-bed at the Rochester works of Woodfield Rochester Ltd

Space is not available to discuss the full range of Woodfield Rochester oilfield equipment, but mention must be made of some ancillary equipment.

Rope Drums

For the multi-layer spooling of wire rope the LeBus counter-balanced system, for which Woodfield are the sole U.K. and Commonwealth agents, has many advantages. It avoids a rope under load cutting-in between the coils of an underlying layer, gives an even fill of the drum from flange to flange, and reduces wear.

Pipe Fittings

For pipelines used for crude oil, fuel oils, drilling muds, etc., the Company has its "Act-on" quick-change unions which are available for working pressures up to 5000 psi, and to 7500 psi to special

order. Various types are available and all are tested to twice the designed pressure.

Also available are flexible ball swivel joints, together with a range of blanking plugs, insulated unions, catline swivels, and collar leak clamps.

Flow Booms

The Woodfield flow boom equipment for the loading and unloading of tankers is to be seen on a number of ocean terminals in the U.K. and in other countries. It is sufficiently flexible to allow the manifold to rise or fall over 85 ft and can accommodate hoses of 8 to 16 in nominal bore. The slewing arc is 150 degrees and the luffing angle 144 degrees. These ranges provide for a drift of about 20 ft in either direction and as much as 10 ft outwards from the berth.

A general view of the extensive works at Rochester

Airfield Hydrant Dispensers

Mobile dispensers for the rapid fuelling of aircraft from hydrants at rates up to 500 gal per minute are constructed in the Rochester works. Types are available for underwing or overwing operation and they incorporate a microfilter system for ensuring the cleanliness of the fuel being loaded. Avery-Hardoll visible register meters are fitted as a standard accessory.

THE WOODFIELD GROUP

Woodfield Rochester Ltd is the parent company of the Woodfield Group of companies which are manufacturing equipment not only for the oil industry but also for many other uses. The operations of these subsidiaries are briefly dealt with below.

Offshore Drilling Platforms

Woodfield Pickering Ltd, a partly-owned subsidiary, undertakes the construction of offshore drilling platforms. By combining the oilfield engineering resources of Woodfield Rochester Ltd with the specialized engineering knowledge of R. Y. Pickering & Co. Ltd and with the facilities of the Lithgow Shipbuilding Group, full construction of offshore drilling units and tenders can be undertaken by one organization for the first time in Great Britain.

Jig and Press Tools

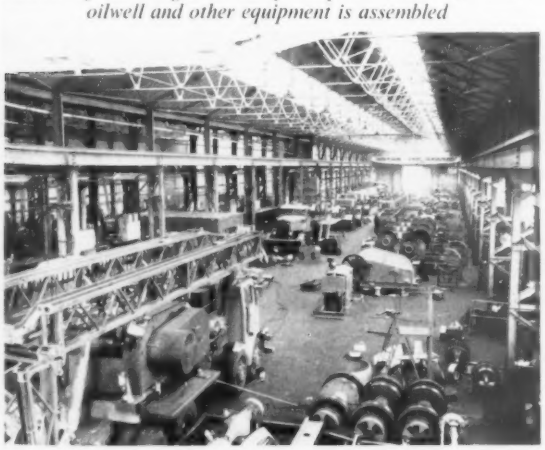
The jig and press tool activities of the Woodfield Group are handled by The Kemworthy Jig & Press Tool Co. Ltd a wholly-owned subsidiary, who have recently acquired new premises at Merton, in the London area. Among the work which has been carried out by this Company for the oil industry are the tools and jigs for the manufacture of four gallon kerosine and gasoline cans of the flimsy type. Other work has involved the manufacture of similar equipment in connexion with hand and power capping machines for the sealing of cans, a continuous filling machine for LPG, and similar operations.

The Company has excellent equipment, some of which is ultra-modern, for the preparation of jigs and tools to extremely close tolerances and can work to dimensions as close as two-tenths of one thou. Its operations are concerned not only with tools for oil can manufacture but also for a wide range of operations in which press tools and jigs are required, including some petroleum testing equipment. It is of interest to record that it had been engaged on the development of some research equipment for studying the flow of oil through sands under pressure in connexion with the study of the properties of oil sands.

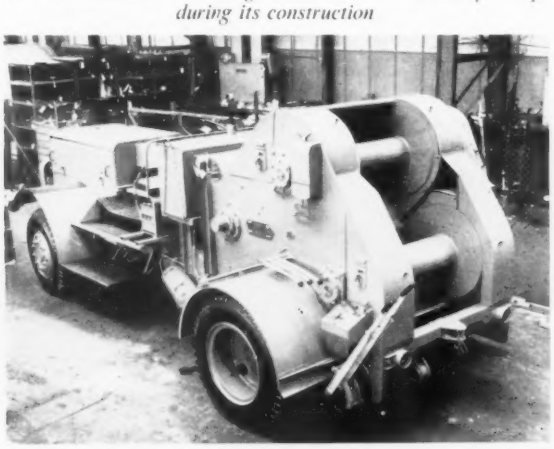
Mechanized Handling

A wide range of mechanical handling plant is made at Rochester by R. H. Corbett and Co. Ltd, a wholly-owned

Interior of the large assembly shop at Rochester where oilwell and other equipment is assembled



A "Fieldmaster" servicing hoist in the assembly shop during its construction



A Woodfield Flow Boom installation at the new Tranmere terminal. It carries six 12 in diameter 40 ft hoses

Woodfield subsidiary. Of special interest to the oil industry are the models designed particularly for the handling of drums and similar containers. Models for operation by electric motor, petrol engine, or by hand are available. A considerable variety of attachments are available to provide for different methods of stacking drums and for changing their position during transit.

Automatic Brick-Handling Machinery

A partly-owned member of the Group is Woodfield Bennett Ltd, a Company engaged in the construction of brick-handling machinery. This is designed for automatic operation and could be of considerable use in oilfield areas where the local manufacture of bricks for permanent buildings might be an economical proposition.

A Woodfield aircraft fuel dispenser which can be handled easily by one man

Lectures, Courses, and Conferences

Lectures on Oil

Three-day courses on the Distribution of Oil and on Chemicals from Petroleum will be held at Sir John Cass College on 5–7 April and 12–14 April 1961, respectively. Further details of the courses may be obtained on application to the Secretary, Sir John Cass College, Jewry Street, Aldgate, London, E.C.3.

Symposium on Industrial Vacuum Plant

On the recommendation of the Joint British Committee for Vacuum Science and Technology, the Institution of Mechanical Engineers is to sponsor a symposium of papers on user experience of large-scale industrial vacuum plant on 1-2 March 1961 at its headquarters, 1 Birdcage Walk, London, S.W.1.

Main object of the symposium is to bring together designers and users of vacuum plant to discuss their problems and techniques. Some twelve papers will be discussed and will be preceded by a general review paper.

Application to attend the symposium must be made in advance to the secretary of the Institution.

Theoretical Rheology Meeting at Reading

The British Society of Rheology are holding a meeting on theoretical rheology at Reading on 20 and 21 April 1961. A wide range of interests will be represented and it is intended that speakers should emphasize the physical aspects of their work rather than the mathematical side only. Further information may be obtained from Dr M. F. Culpin, 8 The Broadway, Pontypool, Mon.

Symposium on Lubrication Engineering

The Institution of Plant Engineers has arranged a Symposium on Lubrication Engineering, which will be open to non-members and will take place on 23 March 1961, in the Meeting Hall of the Institution of Mechanical Engineers.

The symposium will consist of four papers by recognized authorities in the field of lubrication engineering. Preprints will be available before the meeting. After the presentation of each paper adequate time will be allowed for discussion.

The papers will be as follows:

"Lubrication Engineering and the Petroleum Industry", by R. A. Marshall, B.Sc., A.M.I.Mech.E, and H. B. Chadwick, M.A. (*Shell Refining Co. Ltd*, Stanlow);

"Lubrication Engineering and the Chemical Industry", by W. T. Pittman, B.Sc. (*Billingham Division of ICI Ltd*);

"Lubrication Engineering and the Steel Industry", by H. Harber, B.Sc.(Eng.) (*The Steel Company of Wales Ltd*);

"Lubrication Engineering and the Plant Manufacturer", by J. A. McCurdy, M.Eng., A.M.I.Mech.E. (*Turbine-Generator Division, Associated Electrical Industries Ltd*).

The Symposium fee (including one set of preprints, morning coffee, and afternoon tea) will be £1 10*s*. Additional copies of the preprints may be obtained at a charge of 15*s* each. The charge for those wishing to take the buffet luncheon at the Institution of Mechanical Engineers will be 10*s*.

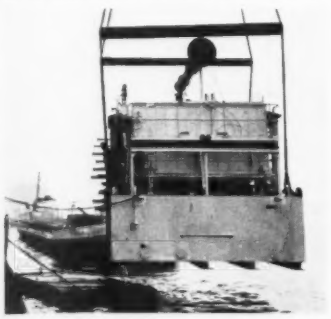
Those wishing to attend this symposium should make early application for registration forms to the Secretary, The Institution of Plant Engineers, 2 Grosvenor Gardens, London, S.W.1.

Equipment Developments

New-type Sea-Water Evaporator for Abu Dhabi

Richardsons Westgarth, of Wallsend, Northumberland, has recently despatched to the Sheikdom of Abu Dhabi, on the Trucial Coast, a fully self-contained sea-water evaporator which will produce 14,400 gallons of drinking water a day. It is also designed to produce electric power to drive ancillary equipment such as fuel pumps, sea-water pumps, brine circulating pumps, etc.

There are no port facilities at Abu Dhabi and the plant, believed to be the first of its kind, will be lowered into the sea some miles off the coast, and towed in to the beach on its own pontoon.



The sea-water evaporator about to be floated down-river at Wallsend to the vessel transporting it to Abu Dhabi

New Alloy Steel for Handling Liquid Gases

The rapid rise in the use of liquefied gases like oxygen, nitrogen, and methane, involving service temperatures of the order of −200° C, has quickly focused attention on the need for materials for handling them with safety and economy.

With this in mind The International Nickel Co. Inc, has developed a 9 per cent nickel alloy steel which has passed rigorous tests conducted in conjunction with The Chicago Bridge and Iron Co., and The United States Steel Corporation. These demonstrated the ability of the new alloy to meet the demand, which underlies the liquefaction and sale of methane gas from oilfields throughout the world, for storage plant and tankers built from a safe and relatively low cost material.

Tinsley Polarograph Mark 200

An interesting new feature of the Tinsley Polarograph Mark 200 manufactured by Evershed and Vignoles Ltd, is a peak reading unit which eliminates capacity current noise from the normal DME and obtains virtually undamped polarograms at all sensitivities without loss of resolution on both direct and derivative polarograms.

Its field of application covers investigations into electro-chemistry, stability constants of reducible compounds and characterization of certain complex organic materials. It is capable of trace determination of materials in solution to better than 0·02 ppm.

British Instrumentation for Indian Pipeline

The instrumentation worth £300,000 to be supplied by Honeywell Controls Ltd to Murphy Radio Ltd as part of the £1-million worth of control equipment for the 720-mile Burmah Oil Co. pipeline in Northern India, is based on a miniature electric control system known as *ElectriK Tel-O-Set*.

It will be distributed over the whole pipeline in 9 pumping stations and 15 repeater stations. It is of a new completely integrated modular design using 4-20 milliamps d.c. transmission along a pair of wires that also carry the 42-volt d.c. supply. Among the advantages claimed for it are the absence of field power connexions and the elimination of shielding for the transmission wires.

This is the first major *ElectriK Tel-O-Set* order obtained by Honeywell Controls Ltd.

★ ★ ★

Trade Literature

Nashton Oscillators

Two new Nashton Oscillators have been annnounced by Nash and Thompson Ltd, Hook Rise, Tolworth, Surrey.

The portable transistor oscillator Type T12 has a frequency range of 20 c/s to 200 kc/s, has a frequency accuracy of ± 2½ of indicated frequency, and is intended for routine production line, laboratory, and educational applications. The quadrature oscillator Type T11 is transistorized battery-driven, and designed for general laboratory and production line work in the frequency range 0·2 c/s to 20 kc/s.

American Water Treatment Equipment for U.K.

Leaflets are now available to introduce the deaeration equipment and filtration plant of Head Wrightson/Belco to potential users in the U.K.

Under the terms of the recent agreement the products of the Belco company are to be manufactured by Head Wrightson Processes Ltd, 20–24 Old St, London, E.C.1.

Fluid Mixing Companies Merge

Lightnin Mixers Ltd, a trans-Atlantic amalgamation of the Mixer Division of Stockdale Engineering Ltd, and Mixing Equipment Co. Inc of Rochester, New York, will manufacture the complete range of products of both parent companies at the Stockdale works in Poynton.

In addition to Stockdale Engineering's five standard units, which form the basis of their fluid mixers for all types of open and closed tanks, the merger will make available to industry in Britain the products of the largest firm in the world exclusively manufacturing fluid mixing equipment. These include units of 1/30 hp to 500 hp which are in use in tanks ranging up to 6 million gallons.

Fluid Mixing, a 30-minute 16mm single sprocket colour film, giving a comprehensive introduction to modern mixing methods, is available free of charge from Lightnin Mixers Ltd, Poynton, Cheshire for showing to study groups.

OIL
PIONEER

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Foreword by President Hoover. As a consultant engineer since the birth of the industry, the author has played a major part in its development. His autobiography is exciting and entertaining as well as authoritative, full of observation and comment on the people and places which he has known, from Mesopotamia to the Caribbean, from Burma to Texas, or Peru.

32 pages of illustrations. 42s. net

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Forthcoming Meetings

THE INSTITUTE

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.)

Queen Elizabeth Islands of Arctic Canada and Their Petroleum Prospects. A. Bryce-Cameron. **18 January**

Radiation Resistant Greases—a Study of Thickeners and Anti-Rads. W. Crawford, B.Sc., A.F.I.P., and D. B. Cox, R.B., M.S., Ph.D. **1 February**

IP ESSEX BRANCH

(At Bull Hotel, Pitsea, 7.30 p.m.)

AGM (7 p.m.). **RAF Competition: London–Paris Race** (8 p.m.) **18 January**

IP FAWLEY BRANCH

(At Esso (Fawley) Recreation Club, Holbury, 7.30 pm.)

AGM and Film Show. **11 January**

Fuel Cells. H. H. Chambers, Ph.D., A.R.C.S., D.I.C., A.R.I.C. **1 February**

IP LONDON BRANCH

Dinner Party. **24 January**

(At 61 New Cavendish Street, London, W.1, 6 p.m.—tea 5.30 p.m.)

Planning Problems in Central London. E. G. Sibert, M.T.P.I., A.R.I.C.S. **23 February**

IP NORTHERN BRANCH

(At Engineers' Club, Albert Square, Manchester 2, 6.30 p.m.)

Railway Dieselization and Electrification. **17 January**

AGM preceded by The Petroleum Industry's Role in the World Car Market. Dr K. E. W. Ridler. **14 February**

IP SCOTTISH BRANCH

(At BP Refinery Recreation Hall, Grangemouth, 7.30 p.m.)

AGM (7 p.m.). **Weather.** W. Gray, M.A., B.Sc., F.R.Met.S. **19 January**

(North British Hotel, Edinburgh, 7.30 p.m.)

Lubrication. G. H. Thornley, M.Sc. **16 February**

* * *

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IP SOUTH WALES BRANCH

(At the Training Centre, BP Refinery (Llandarcy) Ltd, 5.30 p.m.)

Fuels for Rocket Propulsion. R. P. Hagerty, B.Sc., Ph.D., A.R.I.C. **19 January**

AGM followed by Film Show. **16 February**

IP STANLOW BRANCH

(At Lecture Theatre, Grosvenor Museum, Chester, 7.30 p.m.)

AGM (7 p.m.). **The Monte Carlo Method.** Prof. R. W. Revans, B.Sc., Ph.D., M.Sc.Tech **18 January**

Aviation Fuelling Problems. Speaker from Shell Research. **8 February**

IP YORKSHIRE BRANCH

(At Great Northern Hotel, Leeds, 7 p.m.)

AGM. Address by the President. J. M. Leonard, M.I.Chem.E. **8 February**

THE CHEMICAL SOCIETY

(At the Department of Chemistry, Bristol University, 6.30 p.m.)

The Analysis of Plastics. Dr J. Haslam, F.R.I.C. **12 January**

PIPELINE INDUSTRIES GUILD

(At Lancaster Room, Caxton Hall, London, S.W.1, 6.30 p.m.)

Internal Coating. J. Rogers, M.A., M.Sc.Tech. **10 January**

(At Tudor Room, Caxton Hall, London, S.W.1, 6.30 p.m.)

Energy on the Move. Dr J. M. Burns, F.Inst.F., M.I.Gas.E., M.I.Chem.E. **14 February**

SOCIETY OF CHEMICAL INDUSTRY
(Road and Building Materials Group)

(At the Robinson Theatre, Manchester University, 6.30 p.m.)

Surface Active Agents in Bituminous Road Materials. D. H. Mathews. **3 February**

* * *

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CONDITIONS: Under specified conditions first class air sea transport for the successful candidate and dependants (wife and dependant children) will be provided by the Commonwealth.
Alternatively consideration may be given to a three (3) or five (5) year contract of employment in Australia if desired by the successful candidate. In this case the Commonwealth will bear the cost of return fares together with the cost of removing the successful applicant's furniture and effects up to a maximum cost of £500 (Aust), £250 each way.

APPLICATIONS: Forms obtainable from the Senior Representative (AV. 93 11), Department of Supply, Australia House, Strand, London, W.C.2., with whom completed applications should be lodged as soon as possible.

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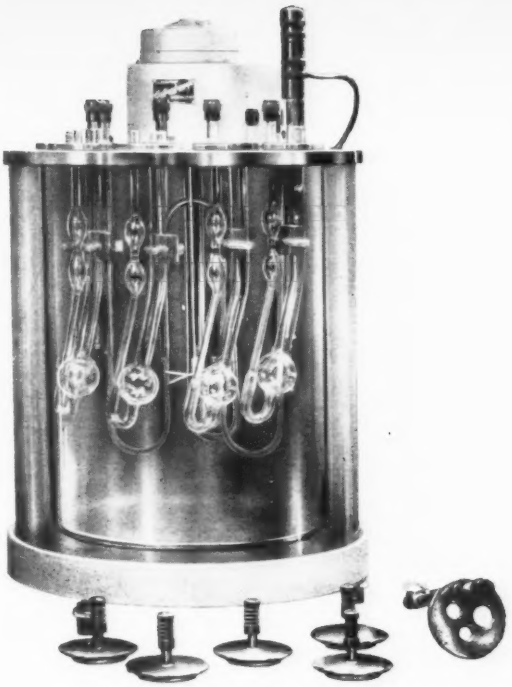
Suitable for methods described in IP 71, BS 188 and ASTM D445



Two types are available, one being a single-walled glass vessel for a nominal maximum temperature of 100° F but capable of successful operation at 140° F. The other is double-walled, comprising one glass vessel inside another and designed for a maximum temperature of 210° F. This model can be used at lower temperatures, if required. Both can be fitted with a cooling coil for circulating a cooling liquid when the ambient temperature rises above the required setting. Five viscometers can be accommodated. Accuracy of control is within ± 0·025° F. at all temperatures and approaches 0·01° F at 100° F.

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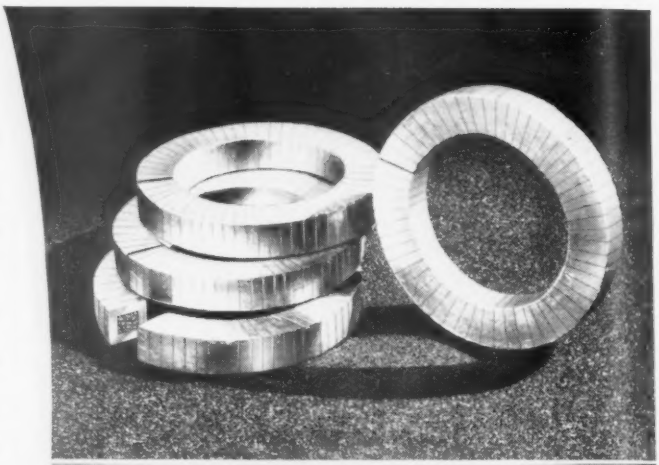

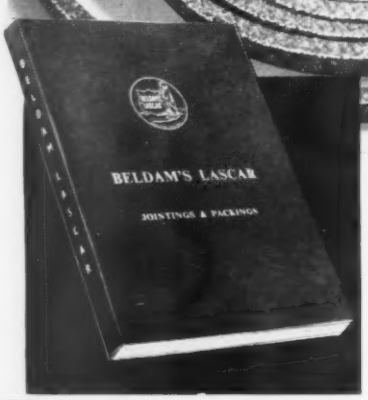

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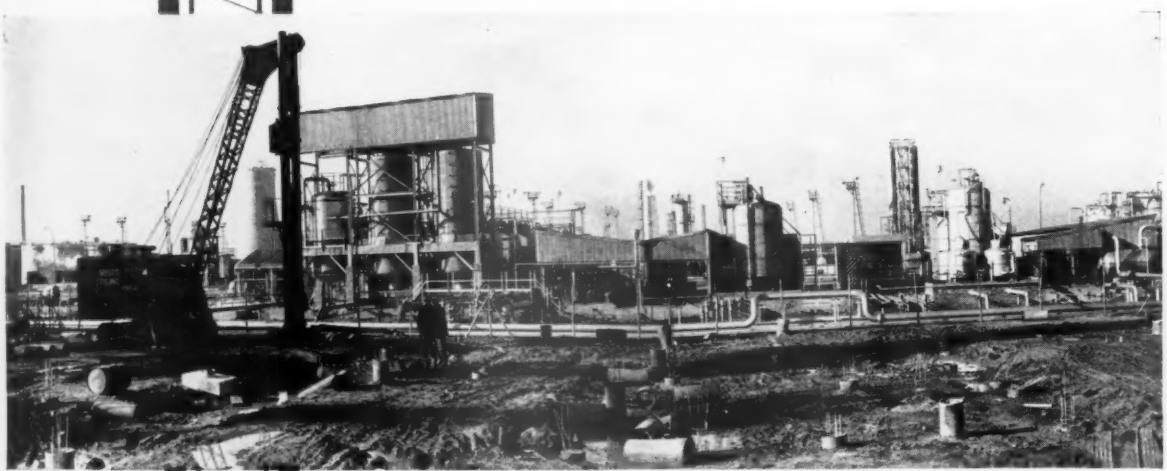
refinery foundations

This mobile piling machine is driving 14½ in. dia. West's Shell Piles to support the foundations of the Predistillation Plant at the B.P. Refinery on the Isle of Grain. Since this important site was first developed more than 11,600 West's Shell Piles have been driven to support many different items of refinery plant and equipment.

West's Shell Piling System, which combines a pre-cast sectional outer shell, driven to a firm "set" in the load-bearing stratum, with a reinforced concrete core cast after driving is completed, has also been used for the foundations of petroleum and allied plant at refineries and storage installations in various parts of the country, including Fawley, Thames Haven, Belvedere, King's Lynn, Partington, Grangemouth and Avonmouth.



Photograph by courtesy of the British Petroleum Co. Ltd

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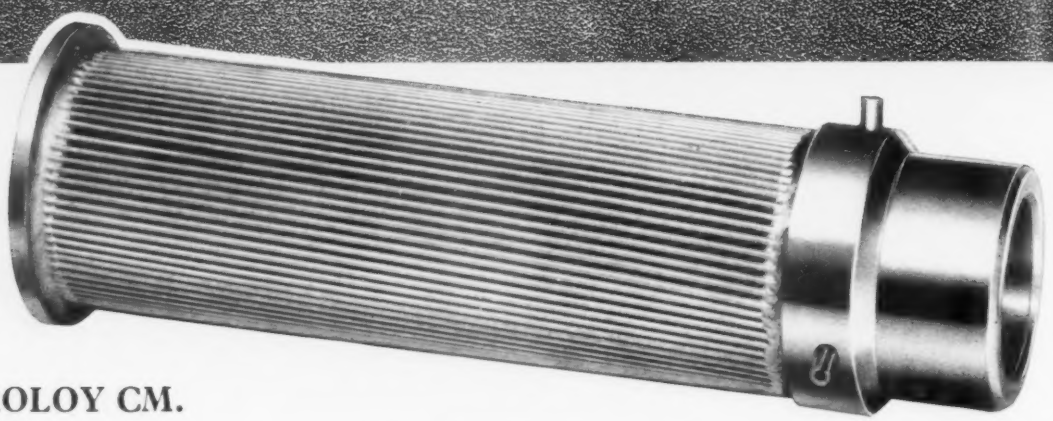

POROLOY CM.

Vokes now introduce a new all-metal filter medium of outstanding efficiency for the *controlled* filtration of hydraulic and lubricating oils, fuels, air, gases, acids, caustics and related caustic materials, chemicals and solvents at extreme temperatures and pressures. Poroloy CM filter elements can be made in any size or shape from a variety of metals – Stainless Steel, Inconel, Nickel, Copper, Steel and Nichrome being the most popular—features which, combined with special production techniques to give controlled pore configuration, enable filters to be individually designed for special applications. Metals can be selected with the particular requirements of the application in mind and the size of the pores can be controlled to deal with particles of between 2 and 250 microns. Poroloy CM filters are therefore 100% effective against a stated particle size, *the danger of media migration being eliminated by an accurately controlled sintering process*. The ultimate tensile strength of the elements varies from 2,000 to 60,000 p.s.i. and the operating temperature range is from —400 F to 1200 F.

The unique combination of properties found in Poroloy CM has led to its recent use in critical temperature conditions in the United States missile and aircraft industries, including installation in the Boeing 707.

POROLOY T.

Similar in performance to Poroloy CM but manufactured by a different process, Poroloy T has an operating temperature range from —400 F to 1500 F. Pore size ratings are from 2 to 250 microns and tensile strength varies from 2,000 to 100,000 p.s.i.

The illustration (above right) shows the many sizes and forms—seamless tubes, flat discs, corrugated elements etc.—in which Poroloy can be manufactured.

Both filter elements are manufactured in conditions of micro-cleanliness and before despatch are individually checked for performance in the bubble point testing equipment (right).

Poroloy was developed by the California Institute of Technology and is manufactured in the U.K. under license from The Bendix Corporation, U.S.A.

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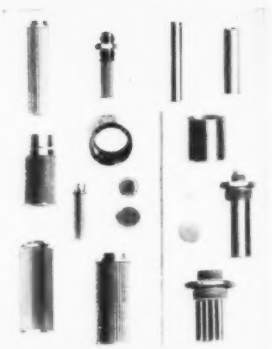

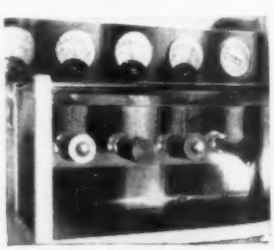

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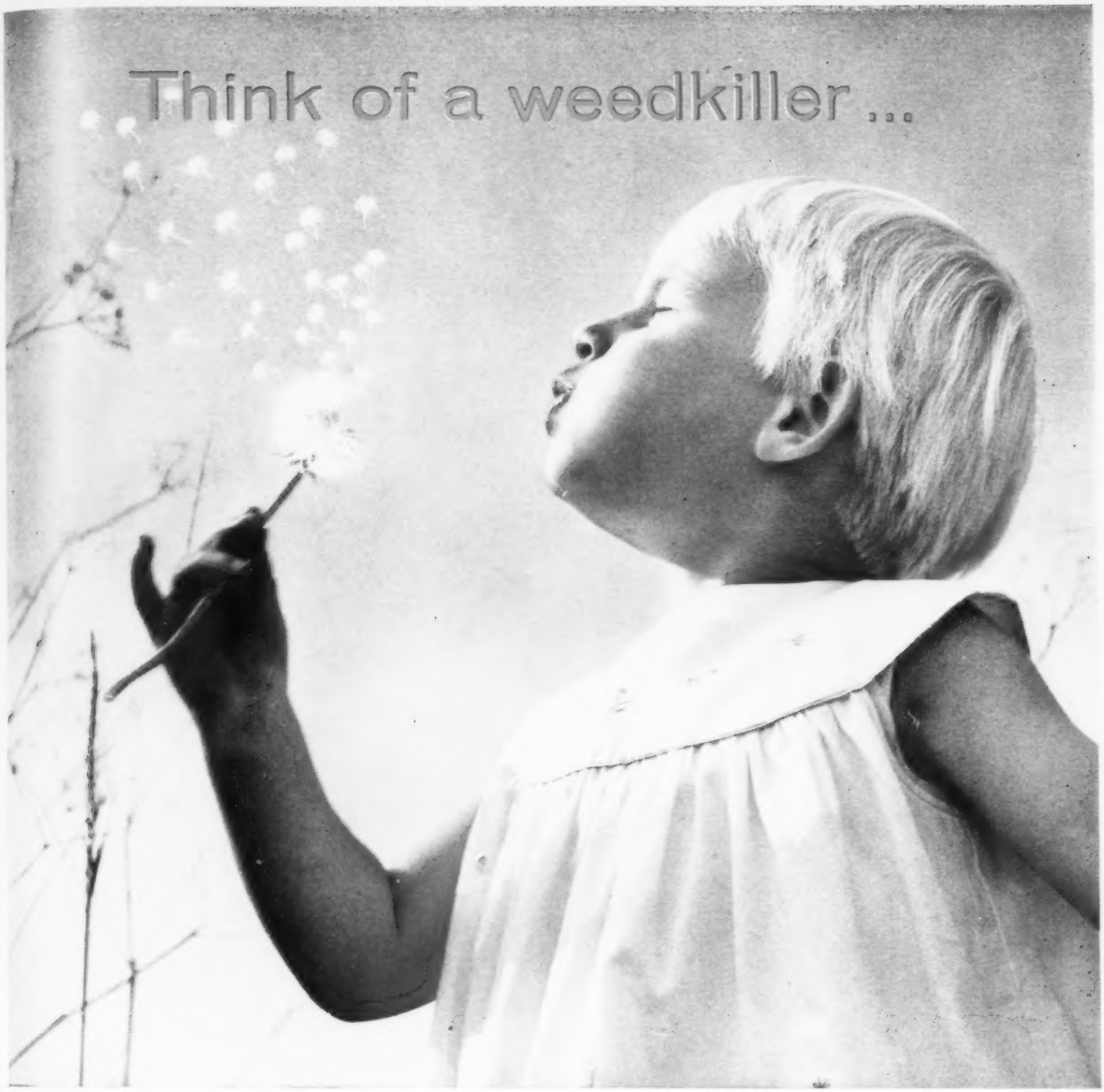

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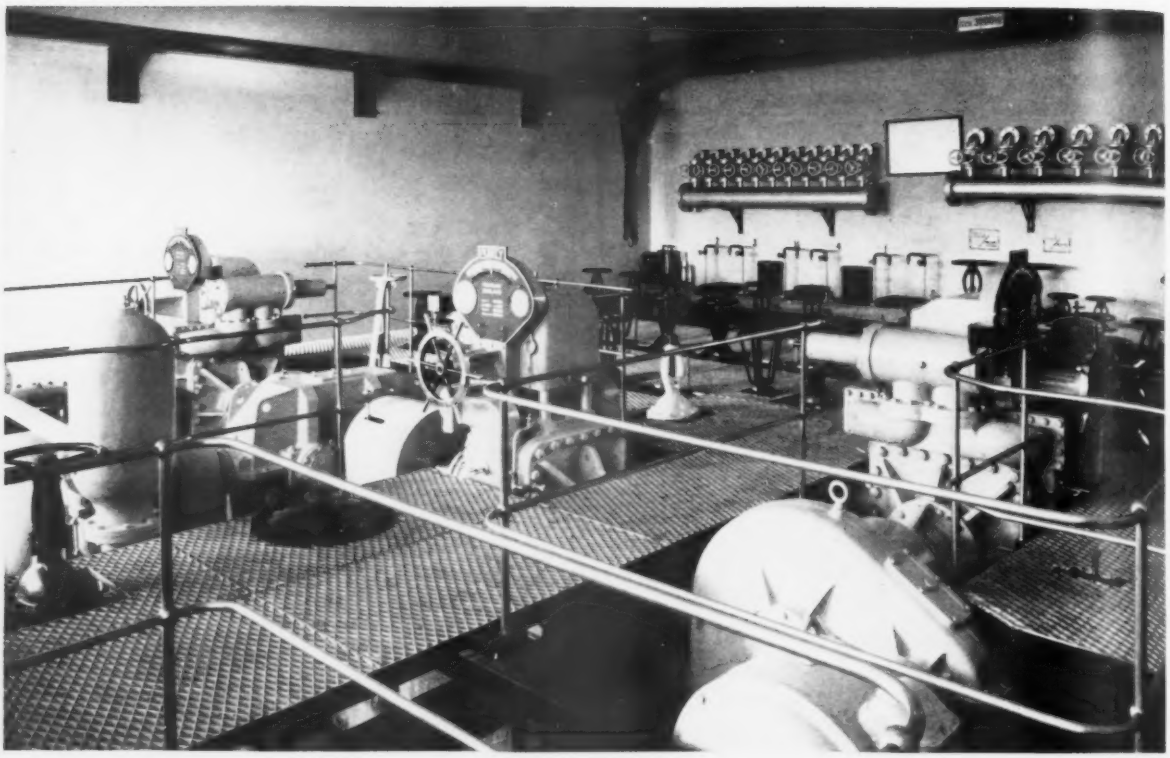

in the OIL INDUSTRY

Shown above are three 200-ton per hour Plenty Variable and Reversible Delivery Pumps installed at the Bunkering Installation of BP Olie-Kompagniet A/S, Copenhagen. These pumps handle all grades of oil from Diesel to heavy bunker fuel and can easily be set to deliver any predetermined grade of fuel oil by the blending of light and heavy base stocks. They maintain accurate blend irrespective of temperature, throughput or pressure head, without any elaborate or delicate apparatus.

Variable and reversible delivery pumps of the Plenty type enable lines to be purged or drained and transfer duties to be carried out with constant speed unidirectional prime movers, without elaborate changeover connections and valves. Plenty pumps are in use at the principal oil installations thoughout the world, and can be supplied with automatic controls of all kinds and with remote control. They are made in sizes from 60 g.p.h. to 750 tons per hour, and catalogues are available covering all their various uses in industry.

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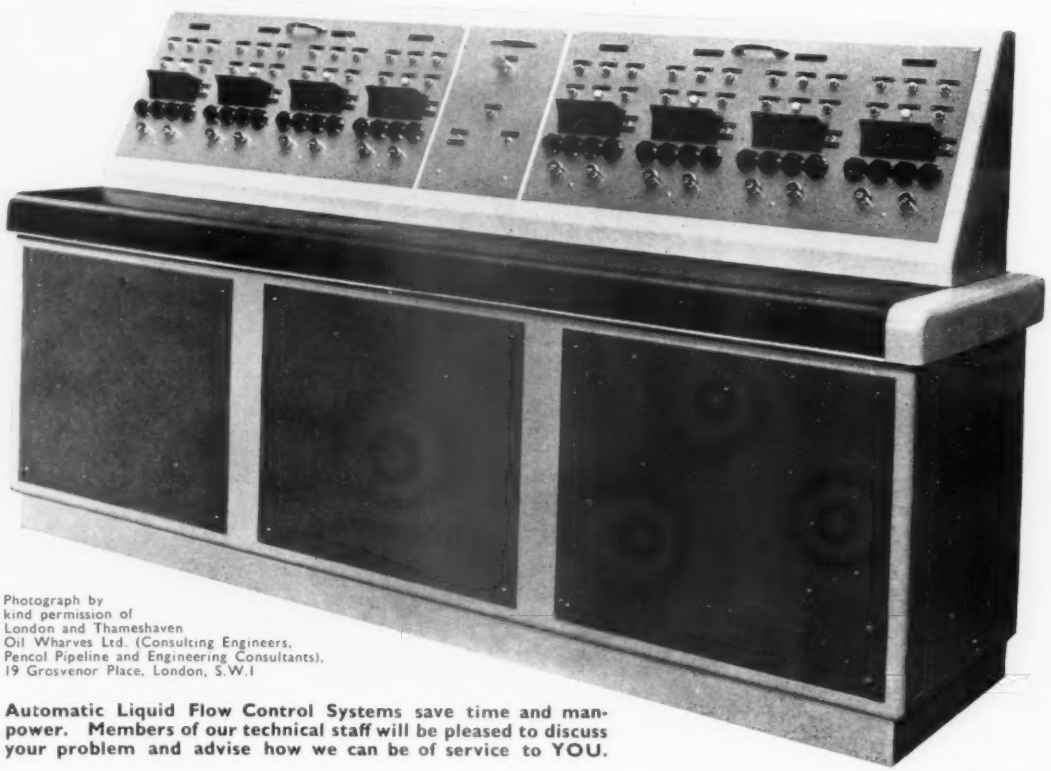

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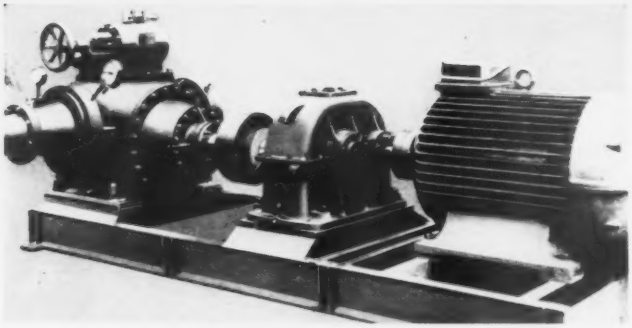

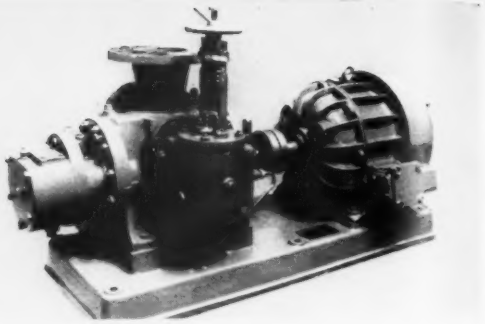

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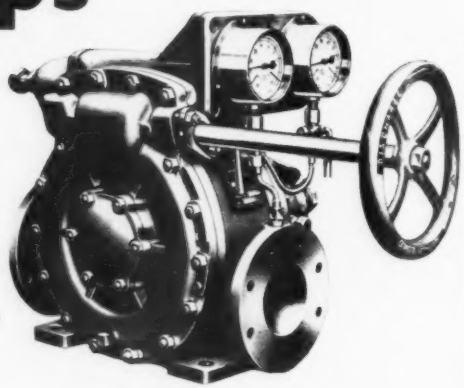
Above right is a Screw Displacement Pump. Of all round clearance design, it has a high suction lift. The flow is pulsation free and the unit self-priming.

Above left is a Variable Output Rotary Piston Pump. It is almost pulseless and is electrically driven through a reduction gear box.

On the right is a Reversing Flow Rotary Displacement Pump for fitting on tank wagons. It is normally driven from the lorry power take-off.



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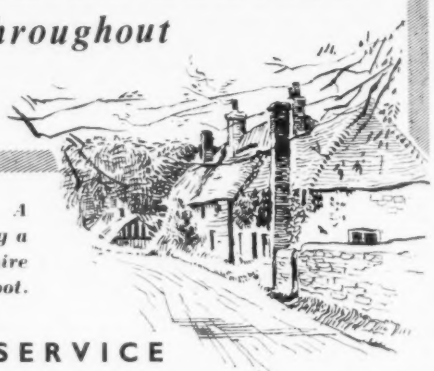

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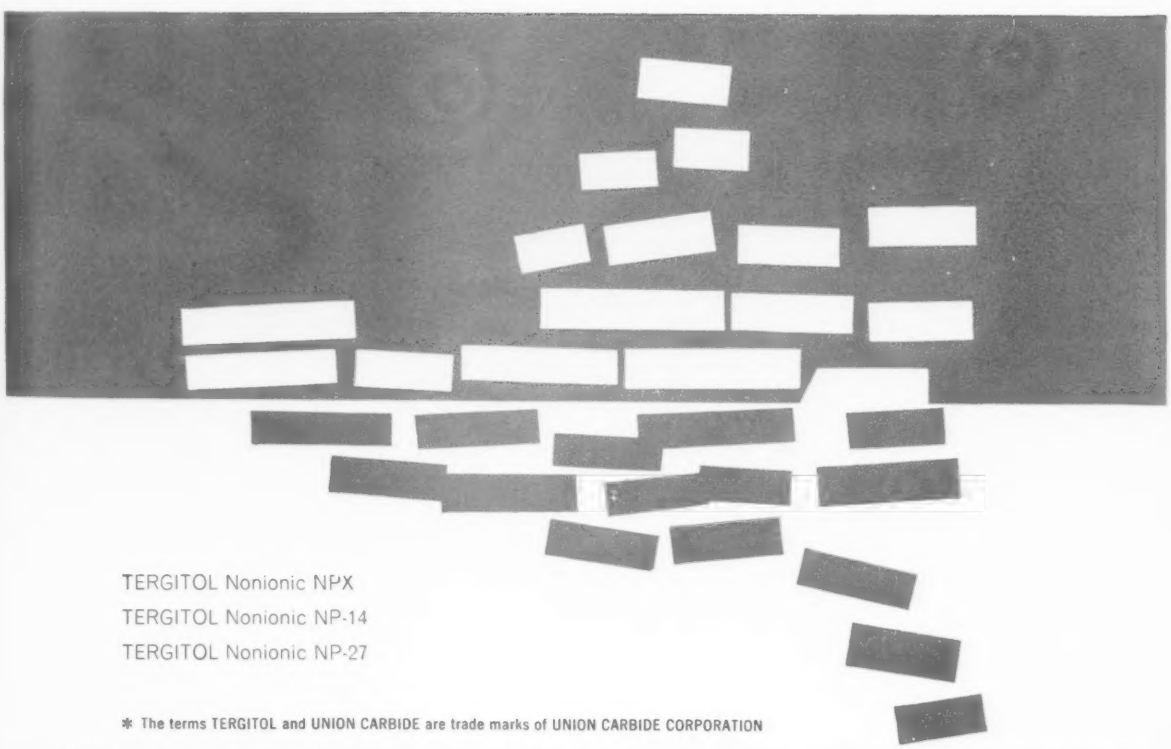

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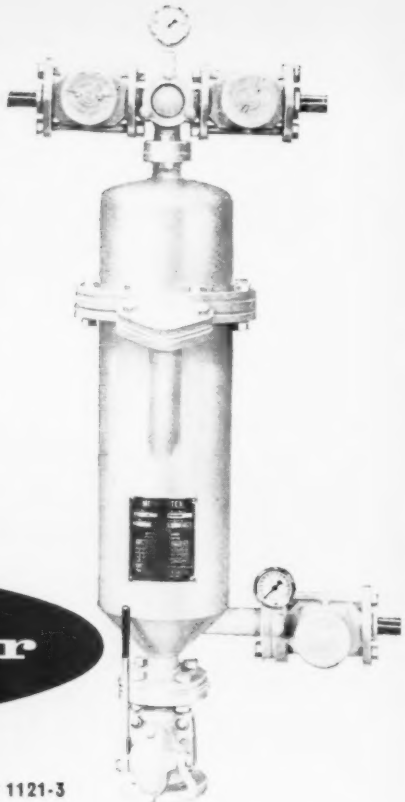

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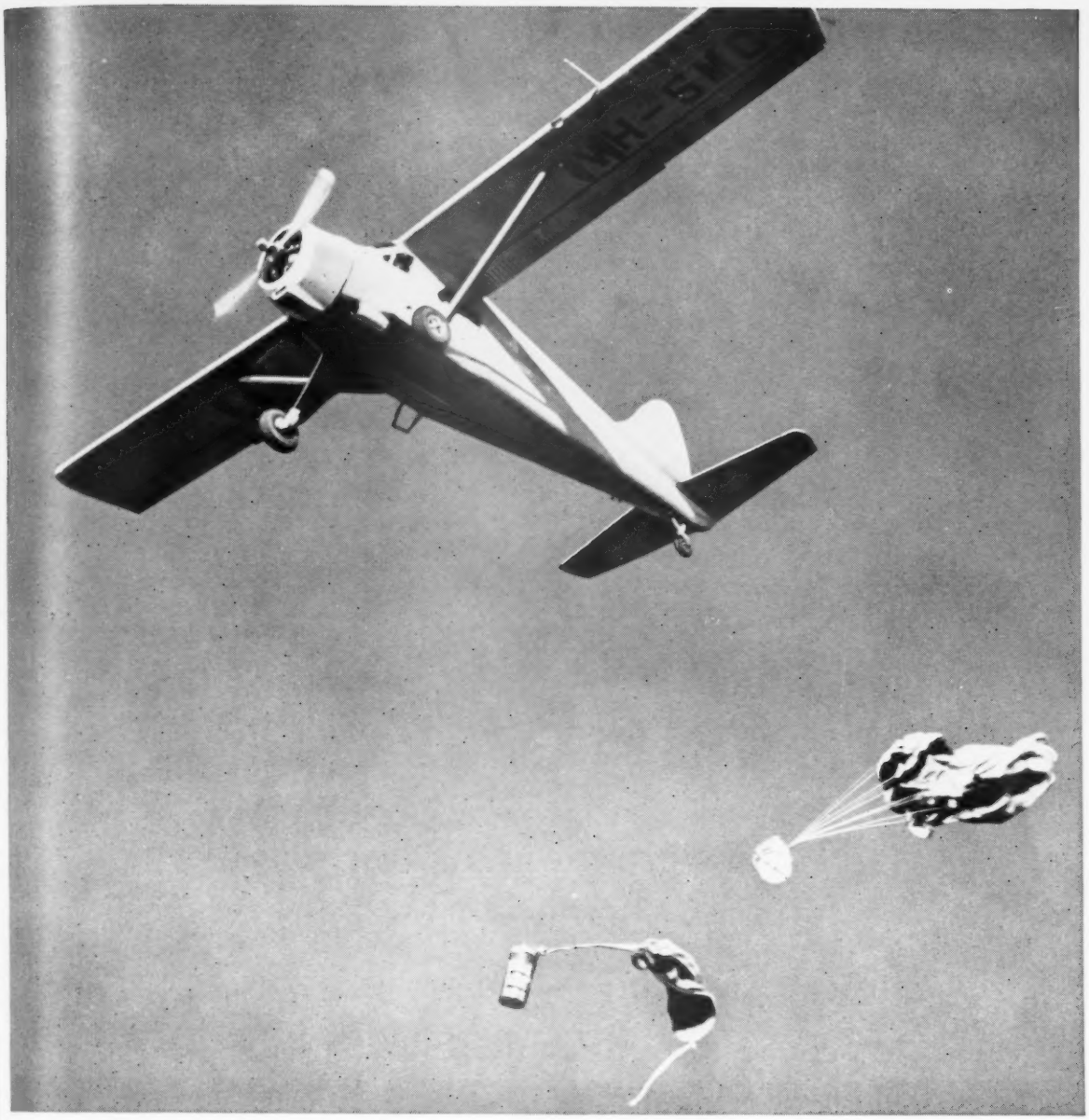

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